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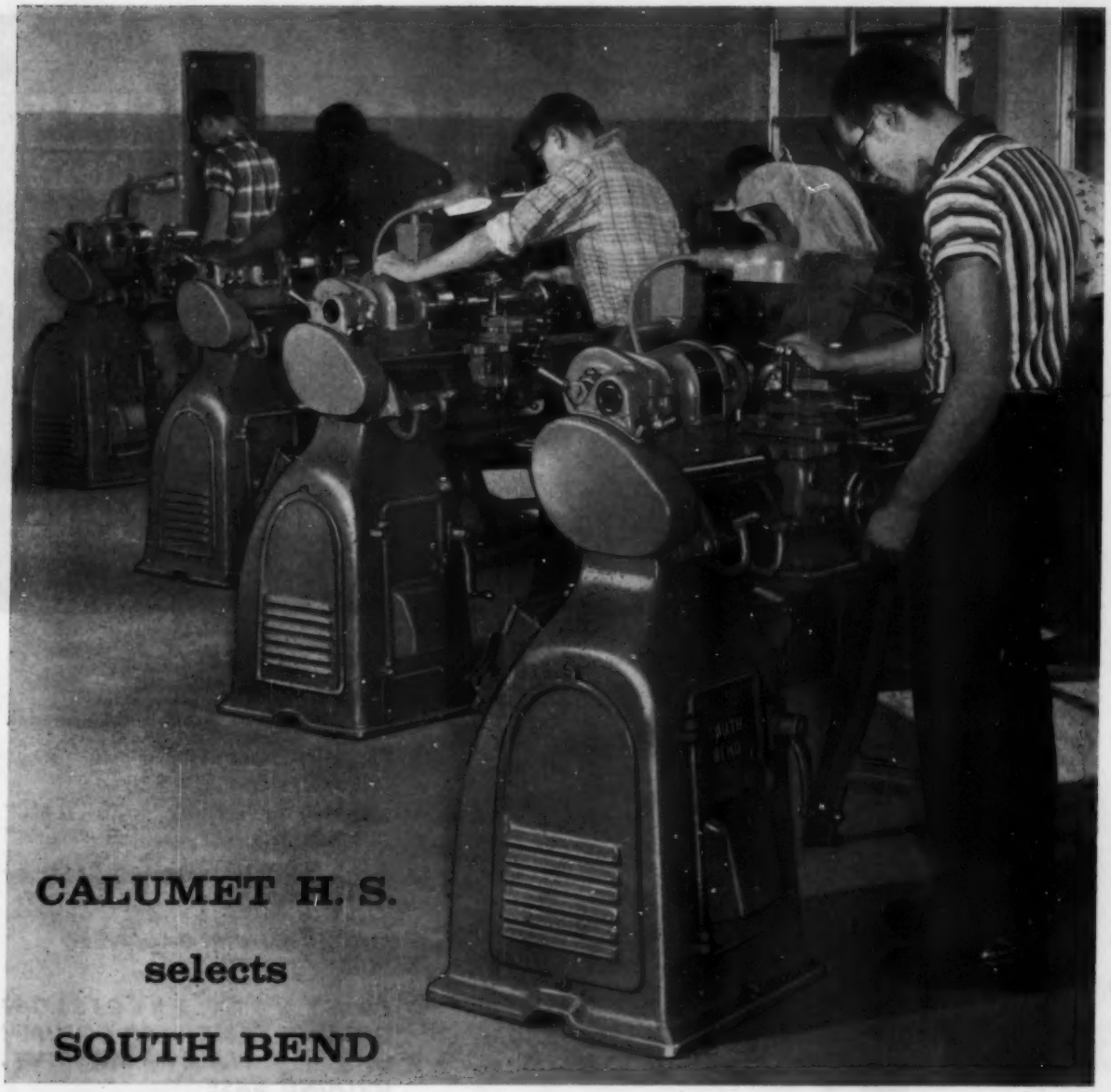

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IA/VE

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your IA/VE for April

One of **three extensive studies** conducted under the auspices of the recently resigned Commissioner of Health, Education, and Welfare, Arthur S. Flemming, **concerned vocational education. A report** — which "constitutes the most comprehensive review of vocational education that has been made in many years," according to Mr. Flemming — **of this study is excerpted in your IA/VE for April.**

The report has excellent chapters on such areas of vocational education as trades and industries, technical occupations, etc., but our review (pg. 14) **limits itself to the report's analysis of (1) the status of voc-ed; (2) its needs during the coming year in strengthening its present scope and in developing new programs in such areas as the aging, the migrant, the handicapped, etc.; and (3) how these needs should be met in terms of financing.** We believe you'll find this digest of this definitive Office of Education report a guide to national thinking about the growing future of vocational education.

Other features we hope you'll have a chance to review:

1. **The "profiles of industry" chapter (pg. 40) on the exciting world of propulsion** which discusses the developments in jet, nuclear, rocket, etc., power plants — as a source of data for next year's courses in power mechanics.

2. **A report (pg. 20) on what's new and promising in program features in industrial arts teacher education facilities.**

3. **A preview (pg. 22) on what has been planned for the AIAA in St. Louis.** The theme, "Technological Advance and the Industrial Arts," is a compelling one — and the program of topics and speakers which will examine this theme from many views is indeed promising. If you intend to go to St. Louis, or are merely interested in learning what will be discussed, look over this special report.

Again, there are the **projects** (pg. 26 ff.) — ten ideas which we believe are rather appealing in metal, woods, electricity-electronics, etc. And then there's another installment in the very popular series, "Design for the Teacher," by John Lindbeck.

Of course, **don't forget the usual departments** — which feature this month **a comprehensive review in "research"** (pg. 8) of Dr. Delmar Olson's approach to industrial arts content.

for May . . .

The special report in your May IA/VE is a detailed analysis of the **administrative problems of industrial education** — intended for distribution to your administrators to serve as a basis for an enlightened and co-operative discussion of the field.

the editors

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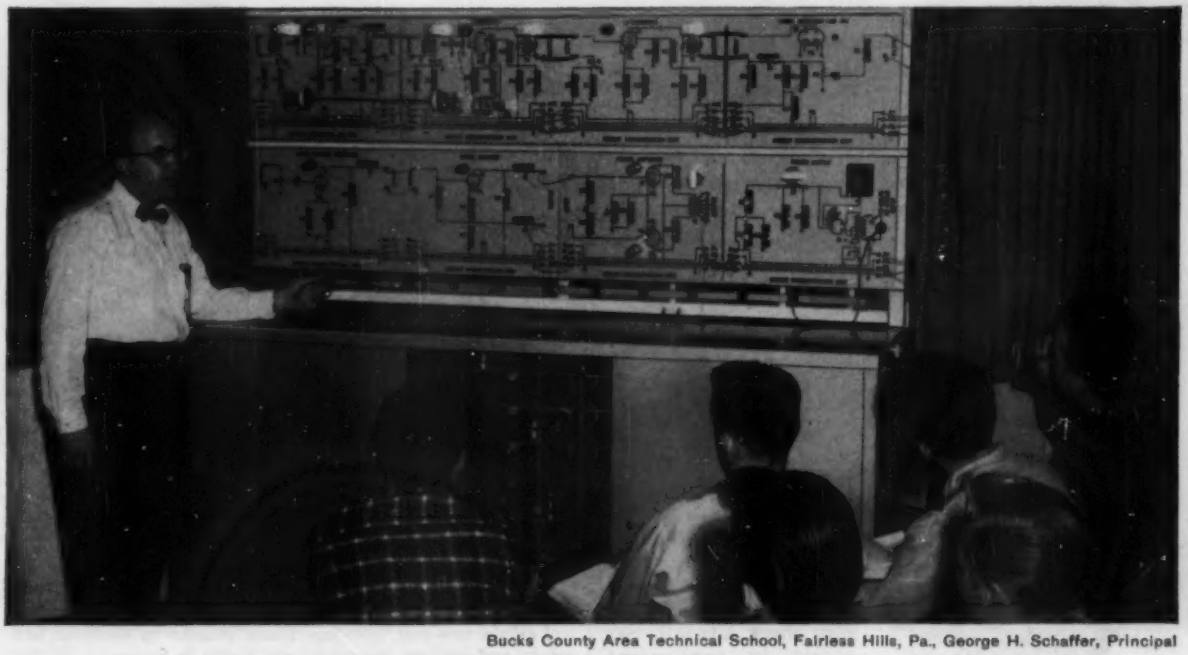

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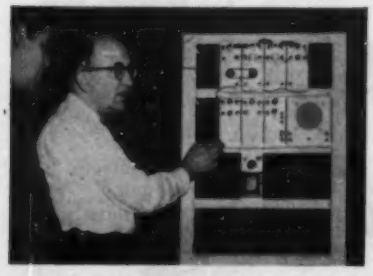

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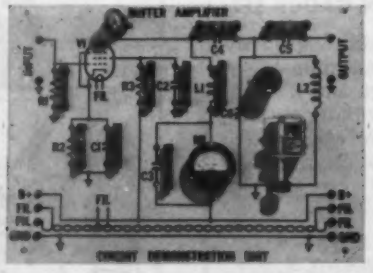

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news

I-A research committee The research committee of the American Industrial Arts Association held a three-day conference on February 2–4 to develop a program of activities of the committee aimed at guidance and leadership in the promotion of (1) research to provide answers as to the status of the profession; (2) the dissemination of research findings; and (3) "grass roots" level activity in the production and utilization of research. Dr. Willis E. Ray, Ohio State University, is chairman of the committee.

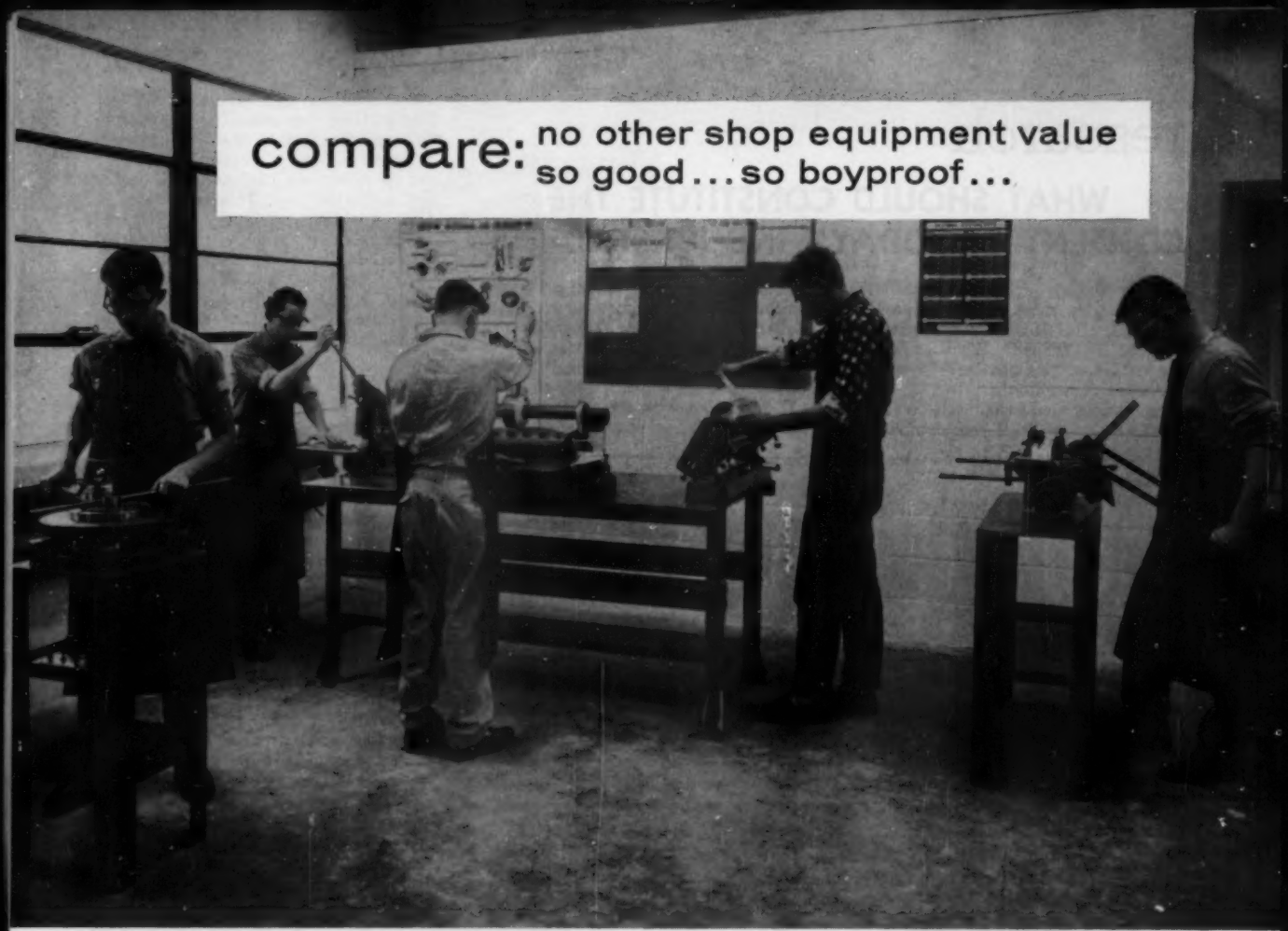
engineering enrollments For the first time in three years there has been only a slight decline in engineering in accredited engineering institutions, according to the American Society for Engineering Education. Total enrollment in the fall of 1960 was 240,000, approximately the same as the fall of 1959; in addition, freshmen enrollments were 1.2 per cent larger than the previous year.

stay-in-school plans The New York city schools has developed a four-phase program to serve the needs of early school-leavers and dropouts: (1) a four-week, full-time "pre-employment course under supervision of guidance counselors until educational requirements have been completed and a job is obtained—and until the student reaches the age of 17 although he has left school"; (2) a project for 16-year-olds who attend school half day and work the other half to develop "effective work habits and appropriate work attitudes"; (3) a regular evening high school to help students complete their high school studies after they complete a day's work; and (4) a work-experience program for those who failed to adjust themselves to school but who were willing to work, which has classes of 25 or less taught by a teacher-counselor who places the students in jobs and visits them on the job and who maintains contact with parents and community agencies.

new course The Springfield, Mo., Vocational-Technical School will offer a two-year, post-high school program in electronic technology and drafting technology and design in September of 1961. "Much pressure is being placed on the public school to train technicians . . . in this period of technological changes within industry," according to David Berryman, Springfield director of vocational and industrial education. "And Title VIII has made it possible for the public schools to meet this need."

(Concluded on page 58)

"Who left without permission?"



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research

WHAT SHOULD CONSTITUTE THE CONTENT OF TODAY'S INDUSTRIAL ARTS?

What should be taught in industrial arts? Exactly what is the purpose of industrial arts? How should course content be ascertained? What should be the nature of this content? In answering these questions there is little agreement among industrial arts teachers. As a matter of fact, considerable disagreement can be found even between teachers in the same school. Who is right? What should be the function and nature of industrial arts? This is one of the most important and most pressing problems in this area.

Let us start with the following statement: "Industrial arts should reflect the technology and derive its subject matter from this technology." Utilizing this statement as a basic assumption, a study* was made to provide a setting for an interaction of American industry and industrial arts. This study was an attempt to point the way to a "new" industrial arts, an industrial arts that gets its subject matter from industry.

The nature of American industry and its technology is under constant change, therefore, it seems that the nature of industrial arts subject matter must also be in a state of continual change. Certainly subject matter accepted 50 years ago is now outmoded.

Machine production has replaced hand production. In many industries, machines are operating machines. Workers must have a greater technical and scientific knowledge. Industry gives a great deal of emphasis to inventing, creating, designing, and research. Certainly industrial arts should do likewise.

Many industrial arts programs still reflect the craftsman-artist concept of industry. They are limited to the old handcrafts tools, methods, materials, and projects for content. Industrial design is far beyond this into an entirely different concept of the integration of materials, processes, structures, construction, and function. This should be reflected in industrial arts.

Six Functions

Dr. Olson organizes his "new" industrial arts around six functions: the technical, the consumer, the occupational, the recreational, the cultural, and the social functions.

1. **The Technical Function.** Industrial arts should provide as many opportunities as possible for pupils to spend at least a year in any phase of work where orientation may help to define specialized interests that can be pursued with profit. The opportunity, for example, should be provided for a pupil to delve into the intricacies of cabinet or furniture making, electrical communication and power, studying the occupational possibilities of certain local industries or any similar problem or group of related problems in one or more areas of the industrial arts program.

2. **The Consumer Function.** A primary purpose of industrial arts is to aid the individual in developing intelligent attitudes and understandings concerning the selection and use of the products of industry. This involves studies and experiences covering a variety of topics and problems involved in their manufacture, to the distribution of finished products and their wise use by the ultimate consumer.

3. **The Occupational Function.** Industrial arts should provide experiences, understandings, and appreciations of vocational conditions and requirements

* Delmar W. Olson, "Technology and Industrial Arts: a derivation of subject matter from technology, with implications for the Industrial Arts Program," 1957, The Ohio State University, Columbus, Ohio.

(Continued on page 10)

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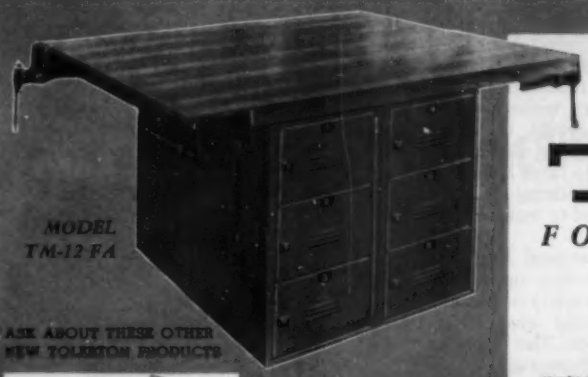

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RESEARCH

(Continued from page 8)

incident generally to the manufacturing and mechanical industries. A study of American industry without concern for its occupations would be little more than a technical study. American industry is becoming so large and complex, it is difficult for youth to see themselves as a part of it and to make occupational choices.

4. **The Recreational Function.** Industrial arts provides opportunities to cultivate a wide variety of useful, wholesome, and enduring leisure-time interests and activities. The importance of this function is increasing.

5. **The Cultural Function.** Experiences in industrial arts should help the individual enjoy a finer culture as regards materials in an involved technological society. This means helping him develop his material inheritance. The pupil can learn how to style or design in architecture, furniture, pottery, silverware, and other items of common use and appreciate the forces that have influenced them.

6. **The Social Function.** Experiences in industrial arts through activities in the shop or laboratory, as well as outside, should help the students develop desirable social habits and attitudes. The program is concerned with helping pupils understand and formulate wholesome opinions toward such things as integrity of workmanship, sanitation, wages, housing, safety and other related social problems.

Analyzing the Functions

Using these six functions as the basis for his "new" industrial arts, Dr. Olson then developed an analysis of each function to identify the nature of industrial arts, define its scope, and establish the limits of its province. This analysis can serve as a guide in the selection of subject matter.

Because of lack of space, only one of these six functions is outlined. A complete copy of this study can be obtained on microfilm by writing University Microfilms, Ann Arbor, Michigan.

AN ANALYSIS OF THE OCCUPATIONAL FUNCTION

I. Nature
   - A. The jobs that industries provide
   - B. How people earn their livings in industries
   - C. The changing nature of the job
   - D. Requirements for a successful work experience
   - E. Opportunities for private business
   - F. Educational requirements and opportunities

II. Representative Occupational Components
   - A. Orientation
     - Opportunities
     - Requirements
     - Qualifications
     - Status
   - B. Guidance
     - Testing
     - Inventory
     - Counseling
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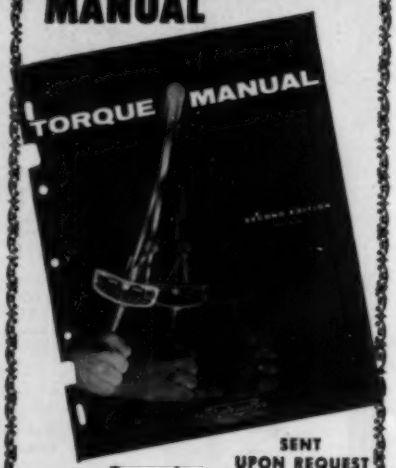

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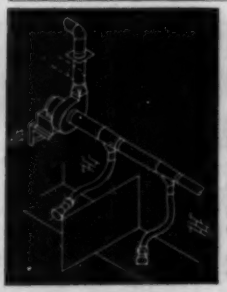

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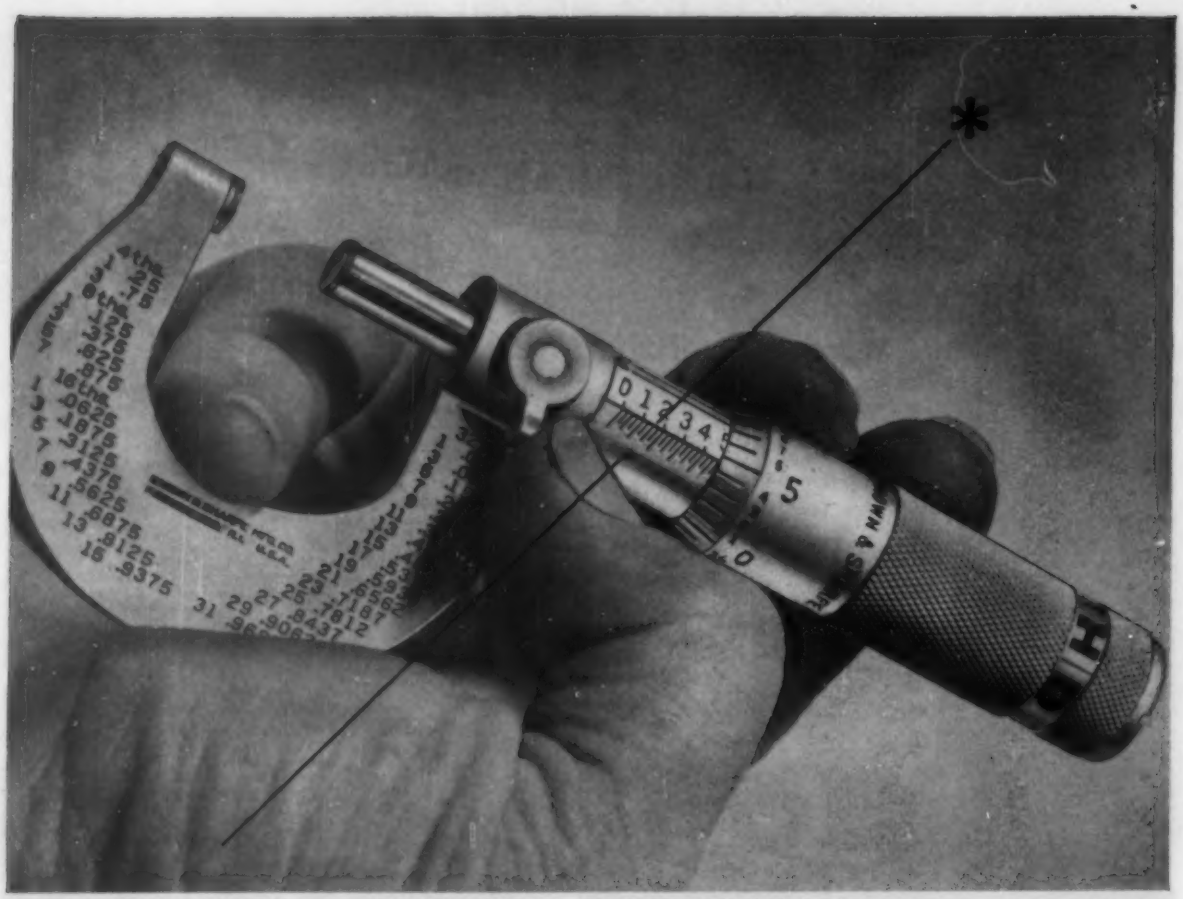

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the editor's stand

A TEACHER VISITS THE MUSEUM OF SCIENCE AND INDUSTRY

On a recent trip to Chicago, your editor had the opportunity to re-visit the Museum of Science and Industry. Any industrial education teacher who tours this outstanding exhibition of scientific and industrial progress cannot help but come away greatly impressed with the tremendous concepts he has seen so ably and cleverly expressed. In addition, and equally important, he leaves the museum with the undeniable feeling that he has seen what is, in essence, the very personification of good industrial arts.

Over the entrance to this fine exhibition hall are inscribed these words, "Science Discerns the Laws of Nature, Industry Applies Them to the Needs of Man." In this building lies a great opportunity for industrial educators to study technological progress. If industrial arts is drawing its content from the major industrial areas and is attempting to teach students something about technological developments, then there could be certainly no better place for study and inspiration which will further these aims and purposes.

Many subjects are traced from the original idea to its invention and on to its final mass production. As is stated in the visitors' guide, the museum's purpose is to picture the experimental beginnings and the fully developed processes which fill the needs of modern civilization and to show how these represent our American way of life.

For the visitor who explores the exhibits, our progress in technology clearly unfolds. For those who are interested in the field of electricity-electronics, there are exhibits on the wizardry of electricity, the study of color television, a display on telephone communications and the electronics of sound and music production. For those interested in metalworking, exhibits on the manufacture of iron and steel, foundry, aluminum, abrasives, machine tools, and the development of civilization through tools offer keen enjoyment and deep challenge. For those interested in woodworking, there are displays of hardwood, engineering and construction techniques, plastics, and the development of all aspects of the home. For people working in power mechanics there are exhibits on rockets, missiles and jets, petroleum, aviation, sea power, and many others. To any industrial education teacher or student visiting Chicago, it is obvious that time spent at the Museum of Science and Industry is of first importance.

In studying the exhibits, the teacher can gain many ideas. Some that come to mind include these:

1. **Simplified instruction.** All of the displays, including instructional materials, are written in a form so clear and simplified that anyone can understand even the most complex subjects. Terms are defined; definitions explained; ideas illustrated. For example, the explanation of how the Echo satellite is used in telephone communication is written in a language easily understood by the eighth grader.

2. **Modern technology.** The display on rockets and missiles is an example of what we are doing today — in 1961 — and represents the latest developments in technology. The cutaway and transparent models of such famous missiles as the Explorer and Pioneer are shown very clearly. Even a mock-up for the man in space, "Mercury" project, can be seen and studied. All exhibits show the most modern practices of our industrial system.

3. **Use of the audio-visual approach.** Industrial education talks a good deal about audio-visual education but does very little about it. These exhibits show the industrial-education teacher the ultimate in the use of audio-visual devices. The cutaways of engines, the charts on color television, the scale model of an atomic electrical plant, the models of interplanetary communication are all excellent examples of good audio-visual education.

4. **Participation by the learner.** Wherever possible, the visitor to the Museum is made an active part of each display. He is asked to do things to show the scientific principles. At one point, the visitor actually sees electrical power as he generates his own electricity by riding a bicycle. Another activity is a game of "tick-tack-toe" with an electronic computor for an opponent. Among many others is a visual representation of the properties of aluminum in which the visitor can operate levers to lift a piece of railroad track of steel and of aluminum.

The teacher of industrial education could spend a good deal of time absorbing the teaching methods and procedures represented at the Museum and apply them to his own field. The Museum of Science and Industry and the techniques displayed there offer unlimited opportunity for this study of teaching methods and procedures. We could strive to use these displays as a standard for our own teaching.

John L. Feirer

Vocational Education in The Next Decade

- A digest of the recent, remarkably complete report by the Office of Education on **the status and future of vocational education.**
- It considers the **accomplishments of Voc-Ed, present labor force and occupational changes, and how these trends will affect this field.** It also proposes **new and expanded programs** to meet these needs and suggests a way to finance them.

— Harry Goldstein

Some form of vocational education has been used in the United States since the nation was founded. The increasing demands for trained man power to serve agriculture, trades and industries, and other occupations led to the introduction of vocational education courses in the public and private schools.

The national programs of vocational education were established as a peacetime measure to assist and stimulate a growing economy. The co-operative endeavor between the federal Government and the states was launched only after intensive research and investigation. In 1914, Congress authorized the Commission on National Aid to Vocational Education. The report of the commission led to the passage of the Smith-Hughes Act and supplementary acts which stimulated the development of comprehensive programs of vocational education.

The co-operative effort of the federal Government and the states in the development of programs of vocational education has proved very effective and federal monies have helped states and local communities to move forward aggressively. It is noted that for each federal dollar spent the states and local school districts are now together spending four and one-half dollars.

The public schools have the responsibility to provide vocational training programs. This education is helping to make available trained man power that enables the nation to produce an abundance of products, compete successfully in the markets of the world, and to help provide for its general welfare and security.

Accomplishments in Vocational Education

Since public vocational education programs conducted under the stimulation of the National Vocational Education Acts were launched in 1917, continuing progress has been made. In 1918, a total enrollment of 164,186 was reported in types of vocational education sponsored by the Smith-Hughes Act. In 1959, a total of 3,701,121 were enrolled in all programs.

Vocational education programs have provided essential training to millions of persons who had entered or were preparing to enter the occupational field. Employed workers have had the advantage of training to upgrade themselves in their occupation and to qualify for a new field of work.

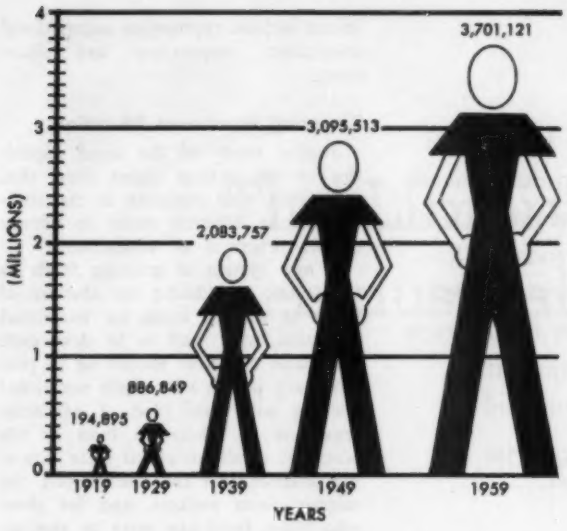
Vocational education programs have likewise been of great service to the nation. During periods of emergency, the nation relied upon these programs to help provide the vital training needed to prepare the manpower demanded in the war industries during World War II and to produce the commodities and services needed by the armed forces and the civilian population. Vocational education was also called upon to assist the Civilian Conservation Corps, National Youth Administration, and to conduct vocational education training programs for veterans.

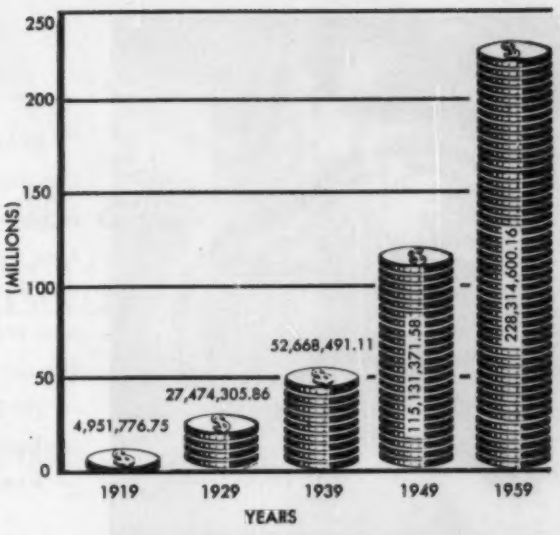
LABOR FORCE TRENDS AND OCCUPATIONAL CHANGES

The United States is undergoing a period of growth unparalelled in the history of the nation. This growth encompasses the population, the labor force, the gross national product, and the school age population. Furthermore, there have been remarkable advances during the past decade in scientific and technological achievement, which point toward even greater progress in the years ahead.

Changes in the Labor Force

The dramatic population growth of





Illustrations of trends in enrollment and expenditures in vocational education.

needs for voc-ed

1. A continuation, expansion, and some redirection of present categorical programs in vocational agriculture, distribution, homemaking, and trades and industry.

2. An expansion of the area programs for technicians authorized under Title VIII of the National Defense Education Act.

3. New programs in rural services occupations, office occupations, and for special groups, including the unemployed, underemployed, school drop-outs, persons who move to obtain employment (especially from rural to urban settings), migrant farm workers, the aging, and the handicapped. In connection with these proposals the report recommends pilot projects, national conferences, new teacher-training activities, and other measures to foster the development of new activities and methods.

4. An increase in Federal, state, and local expenditures for vocational education programs from $267 million in 1961 to $570 million annually by 1970. By 1970 the report postulates that $109 million will be needed for the new programs. (Financial projections are given in more detail in the table attached.)

the 1950's is expected to continue during the 1960's. Experts predict that there will be an increase to 208 million by 1970. The labor force will grow at an even faster rate than population in the next ten years. It is expected that the number of workers will increase by about 13.5 million to 87 million. The work force will increase rapidly because of the large number of children born during the postwar period and the increased number of women, particularly those over 35, who will enter the labor force. It is estimated that by 1970, almost 50 per cent of all women age 35 to 64 will be in the labor force. The rising level of educational attainment by women, the use of labor saving equipment in the home, packaged foods, commercial services, and improved transportation have made it possible for women to accept commercial employment. Population trends indicate that 26 million young people will enter the labor force during the 1960's.

About 70 per cent of these young workers will be high school graduates, whereas only 60 per cent of the young people who entered the work force in the 1950's were high school graduates. Even though much progress is being made, it is expected that millions of young workers will still lack a high school education. Current trends indicate that about 7.5 million of the young people who will enter the labor force during the 1960's will not have completed high school and 2.5 million will not have completed even the eighth grade.

Labor Force Growth

The occupations people enter today are quite different from those of former years and further changes can be expected in the years ahead; for example, 50 years ago more than 30 per cent of all workers were on farms compared with fewer than 10 per cent today. During this same period, clerical occupations increased from 5 to almost 15 per cent. A gradual shift has been underway from farm and blue collar occupations to white collar occupations. The greatest growth in recent years has been in the professional and technical occupations and in the clerical occupations. Professional and technical occupations are expected to grow more rapidly in the future followed by clerical and sales occupations. The proportion of blue collar workers will not change much; the proportion of craftsmen will increase considerably, and there will be a decline in the proportion of unskilled workers.

Occupational Trends and Voc-Ed

The many changes taking place in the occupational fields will have significant influences on the needs for vocational education. Changes in the economy and scientific developments are creating many new occupations. The following examples illustrate some of these developments. The entry of America into the space age is creating thousands of new jobs. Atomic energy is a rapidly developing field that offers many opportunities for employment. The growing fields of air transportation and automation are providing many types of employment opportunities. There is a considerable growth in health service occupations because of the large increase in the population and the higher standards of medical care. The demand for technicians, especially those who will assist scientists and engineers, is increasing.

— Harry Goldstein

"I believe that one of the most pressing needs in the vocational education field today is for more experimentation and greater flexibility in the development of programs and methods. . . ."
— FLEMING

PROPOSALS FOR MEETING FUTURE NEEDS

Extension and Modification of Current Programs

Providing adequate vocational education for the work force of the nation is a complex and difficult problem and requires essential staff and desirable facilities. Vocational education, therefore, is currently available to only a portion of those who are in need of such education. The increasing demands for trained manpower, economic and social developments, and technological and other developments make it necessary to extend vocational education programs and modify the present programs so they will more adequately serve the nation. Programs of vocational education should be evaluated carefully so that sound modifications may be made. Programs should be continued, extended, or reduced according to the need for trained workers.

Instruction in vocational education should be made available for all persons who wish to prepare for entrance or to advance in an occupational field. Many persons do not have that opportunity today because of limitations on the scope of the programs and geographic areas that are not served. Area programs of vocational education should be expanded throughout the nation to make available comprehensive offerings to persons who do not have the opportunity to receive such training.

Development of New Programs

The continuance and extension of the current vocational education programs will not meet all of the needs for vocational education. Certain groups need to have special vocational education programs provided for them.

The Unemployed. Programs of vocational education, including counseling and guidance should be made available for the unemployed to enable them by training or retraining to obtain satisfactory employment.

The Aging. Programs of vocational education should be designed to meet the special needs of the aging. These programs should be co-ordinated with other governmental or nongovernmental activities that have programs and activities for this group of senior citizens.

The Handicapped. Vocational education for the handicapped in special programs designed to meet their peculiar needs should be planned in cooperation with the Office of Vocational Rehabilitation and other agencies and organizations concerned.

Migrant Farm Workers. Programs of vocational education for youth and adult migrant farm workers to help them improve their occupational status in agriculture or in other fields of work are needed.

Persons Who Move to Obtain Employment. Programs of vocational education should be provided in both rural and urban areas to meet the special needs of those who migrate to obtain satisfactory employment.

School Dropouts. Special supervised work experience programs should be provided for youth who have dropped out of school and remain underemployed, as well as for potential dropouts for the purpose of increasing the holding power of the school. The programs made available to them should include appropriate occupational orientation, preparation, and placement.

Financing Vocational Education

Studies made of the fiscal capacities of the various states show that there is a wide variation in the abilities of the different states to finance needed programs of education.

A new system of granting funds to the states, considering the abilities of states to provide funds for vocational education, may need to be developed. The basic objective should be to provide each person who needs vocational training with that type of education regardless of where he lives or the economic condition of his state. Training programs for the unemployed, the migrant farm workers, and for those who move from one state to another, would be of great service to the nation. Where programs are national in character the federal government may need to provide a greater portion of the required funds than for a program primarily meeting a state need.

In 1959 a total of $228 million was spent by local communities, states, and the federal Government primarily for salaries of teachers to provide vocational education in the public schools of the nation. It is estimated that this expenditure will be $267 million in 1961. This amount does not include the large expenditures for such items as buildings, equipment, and land. Tentative studies indicate that a minimum of $10 million will be needed in 1962 to launch the proposed new programs for special groups. The increases in funds for these groups should be determined after careful evaluation of pilot programs conducted for these groups. Present estimates indicate that by 1970 there will be a need for funds for these special groups and other new programs in the amount of $108,750,000. The share of this total that will be provided by the states and by the federal Government will depend on the grant structure and the special programs that emerge.

Additional funds will be needed during the decade ahead to make possible the modifications and extensions which are needed in the current programs. It is estimated that there will be a need of an increase of $50,515,000 in funds for the expansion of current programs in 1962. A careful study should be made immediately to determine the increases that will be needed in these programs by 1970. Present labor force trends and the population growth indicate that substantial increases in funds will be necessary to provide the vocational education programs that will be needed.

(Concluded on page 50)

The Library as a Part of Industrial Education

NORMAN TANIS

- What can the library contribute to a program of industrial education? Here is a report on the scope of these services as provided at the Henry Ford Community College in Dearborn.
- It points out the ways the library's five-point program serves the faculty and the students through such effective ideas as class visitation by the librarian, individual student counseling, displays, etc.

The controlling purpose behind vocational education is to prepare its students for gainful employment. One of the most important aims of the community college library is to assist the departments of the college it serves to achieve their goals (1) by maintaining collections of books, magazines, and pamphlets, and (2) by assisting students from these departments to use these library resources efficiently. This means that libraries are an important part of the vocational education movement. However, the assistance of the community college library will be effective only if it is able to co-operate closely with the vocational education department.

However, technical and vocational programs in many high schools and community colleges often operate quite independently of the library attached to their institution. Too many teachers of vocational and technical courses consider the library as a service useful primarily to students and faculty in liberal arts or academic courses. For this reason, they make little or no use of the library in their own teaching.

Mr. Tanis is the librarian, Henry Ford Community College, Dearborn, Mich.

Nevertheless, the habit of technical and vocational bypassing the library is breaking down at the Henry Ford Community College in Dearborn, Michigan. This two-year college offers a variety of technical programs, providing many opportunities for young men to prepare themselves for jobs on the technical level in industry. Full-time, two-year programs are available to high school graduates in drafting, electronics, metallurgy, and automotive technology. Most of the courses offered during the day are also offered in the evening, so that men already established in their jobs can attend classes. In addition, related trades instruction classes are offered to men in skilled trades desiring a program to qualify them for journeyman status in die making, industrial electricity, industrial hydraulics, metal pattern making, plumbing, diesel engine, machinist, millwright, and many other occupations and fields.

Objectives of Service

With these technical and vocational programs in mind, the library of the Henry Ford Community College has defined its objectives of service. For we are determined to be a vital force in the training of technical students. And we are certain that the library can be made as indispensable to the training of students studying job processes and plant layout, as it is for students studying English literature.

As a blueprint, we have spelled out the following objectives: (1) to work closely with the technical-vocational faculty in the planning of its courses in its departmental share of the library book budget and by lending out small collections of library materials; (2) to familiarize the library staff with the courses and aims of the technical program and with the specialized needs of technical students; (3) to help these technical students use the books and reference tools in their field more effectively; (4) to encourage and guide the recreational reading of technical students; and (5) to make the library and its services as important to the technical students' education as their laboratory or work experiences.

Serving the Faculty

In support of these objectives, the library staff has done everything possible to co-operate with the technical faculty, first of all, in the planning of their courses. Although we suffer from cramped quarters, as do most growing libraries, we have provided desk space near the periodical stacks for the technical instructors to prepare their lectures. These quarters are close to bibliographies and indexes that these teachers use. In our new library, now under construction, we have provided two small offices or carrels where faculty members can use library materials to plan new courses, to compile reading lists, and to advise and help their students who are working with the library's resources.

The library staff has provided this desk space because it is well aware that

Above: a technical educator uses the study space provided in the library for research. Below: a vocational student is coached by a librarian in the use of the **Applied Science and Technology Index.**

Industrial education students look over the books and magazines on display in the library at Henry Ford.

the constant changing of the vocational, technical and engineering programs demands that these instructors keep up with these changes and with new materials. Teachers and administrators in this field are like contractors attempting to build a house for which the plans are continually being altered; they are constantly adding and dropping courses to meet new community needs. Therefore, these instructors must spend a great deal of time in research for new course material, in compiling bibliographies, checking on pertinent technical articles, and, generally, in keeping up with their fields. The library's several thousand technical books and 55 technical journals, together with room for the instructors to work with these resources in privacy, contribute to the success of the constantly changing vocational training program.

The library staff also co-operates closely with the technical teacher by means of its departmental allocation of the library book budget. A definite sum from the library's book budget is set aside to be spent by the technical-vocational program. Each year the librarian negotiates with the head of this program on the percentage of the total allocated book budget that the technical-vocational department can spend. Teachers are encouraged to order books through the chairman of the department; we feel that by this means the technical teachers will be stimulated to participate more in building up the collection of technical books and periodicals.

Still more important, the technical department has representation on the faculty-library committee which helps formulate major library policy, approves the library budget, and acts as liaison between the library and the faculty. No long-range plan is made without being submitted to the deliberations of the faculty-library committee, an important and powerful body.

As an additional service, the library aids the technical instructors by lending them small collections of reference books, textbooks, pamphlets, and technical journals for use in classrooms, laboratories, and faculty offices. We believe that accessibility of library resources is important in making books and related materials useful instruments in education. Obviously this plan, together with our insistence that all library books be placed on open shelves completely accessible to students, has resulted in the loss of some books. Of those books lost, however, about a third do return to the library after a year or two. On the whole, we feel that the benefits of accessibility to library resources well outweigh the nominal cost of replacing lost books. The cost of duplicating some of the titles loaned out to classrooms has also been found to be small in comparison to the value received.

Visiting Classes

As a further step toward closer co-operation with the technical-vocational department, the librarians are encouraged to visit technical classes to learn more about their content and methods. We believe that there is no substitute for the knowledge of a subject gained firsthand. Many librarians are notoriously ignorant of technology and applied science and are, therefore, understandably cautious and backward in offering help to students in these areas. Since most of the training librarians receive is in the liberal arts, we feel that the best way to serve technical-vocational students more efficiently is to sit in their classes with them and learn something of what they are learning. Of course, these visits are not as regular or as frequent as we might wish. Nevertheless, we are convinced that the results of these visits will more than justify the time spent.

A boxer is only as good as his punch; no amount of flashy footwork or resourceful defense is much good without

it. No matter what kind of fine relationship the boxer may have with his manager, he is going to hit the canvas unless he can punch. Similarly, unless a library can make some kind of impact on the student, all its books and efficient management are quite meaningless. Therefore, although service to the technical instructors at Henry Ford Community College is important and in many ways indivisible from service to students, the most important part of our program consists of helping students to use the library effectively. Our greatest concern has been to make sure that these technical students use the library readily, intelligently, and habitually. We also hope that they will gradually gain the habit of coming to the library for recreational reading. If we accomplish this feat, we will have made our "Sunday punch."

Serving the Student

One of the ways we attempt to make a direct impact upon the student is through lecturing to an individual class at a time when this class needs to consult the library. The librarian comes to the class with several armloads of books in order to show how some of the many handbooks, technical encyclopedias, technical dictionaries, and periodical indexes can help the student in this particular class. At these informal sessions, the librarian attempts to answer any questions the students might have about the library and its resources. We have found that after such a lecture, students are much more free in coming to librarians to ask for help. Once the librarian has made contact in the classroom and has demonstrated his knowledge of books that will help the student in his field, it is astonishing how eager he becomes to draw on the librarian's knowledge. Probably, in the past, technical students were convinced that librarians knew nothing about his subject problems and could not be of any real assistance to him.

This experiment of lecturing to individual classes about resources in their particular field has been unusually successful. At the same time, it must be admitted that not all the technical instructors have taken advantage of this service of lecturing to individual classes because, in most cases, their courses may not lend themselves to any great degree of help from library resources.

A second way in which the Henry Ford Community College Library staff tries to help the technical student use the library effectively is by means of informal counseling sessions between student and librarian about a reference or research problem. Often these consultations take a great deal of time, because the technical student may need detailed instruction in using a particular library tool, such as the *Applied Science and Technology Index*. These leisurely sessions, during which the student states his reference problem and the librarian suggests possible materials to consult, often teach the student how to use such resources as the card catalog, a bibliography such as Hawkins' *Scientific, Medical and Technical Books Published in the U.S.A.*, and several kinds of dictionaries and handbooks. We believe that this method of informal consultation helps technical students to form life-long habits of using the library. If these students learn to use the basic tools in their particular field, this indispensable skill will greatly aid them in furthering their education as well as in showing them how to use their neighboring public library. Eventually, a number of these students will be using special research libraries supported by large industries. We are firmly convinced that by helping the student to use the library more effectively, we will have helped him acquire an educational skill of life-long benefit to him.

It logically follows, therefore, that if technical students are to use the library skillfully, they must be guided by professional librarians readily available for consultation and advice. All too frequently much of the student's contact with the library is through a well-meaning but untrained student assistant manning the circulation desk. In order to avoid this dangerous misuse of student assistants, the Henry Ford Community College Library maintains a professional librarian at the main library desk at all times. In fact, go one step further; librarians attempt to become floorwalkers, much like floorwalkers in department stores. We do not think that librarians should wait until a desperate student finally musters up enough courage to ask a librarian about a problem.

A third way in which the library attempts to help the technical student at Henry Ford Community College is by bringing to his attention a number of different services intended to meet [illegible] reading needs. Although technical [illegible]ents are often erroneously classified as nonreaders, it would be a serious mistake to underestimate their lively interest and curiosity in many different areas. It is true that they are usually more interested in "doing" rather than in abstract "understanding." However, experience has taught the library staff that technical students cannot easily be categorized. In view of this, we have tried to meet the diversified interests and abilities of technical students by means of these four methods:

1. We construct displays of technical books and magazines, which we feel will interest the technical student. Included in these displays are books and magazines gauged to his course requirements as well as to his recreational interests. Such magazines as *Notrod*, *QST*, and *Popular Mechanics*, as well as a number of different "how-to-do-it" books are included in the displays. We also try to include books dealing with the history and background of technology; often we feature a few volumes from the important set, *A History of Technology*, or the new *Encyclopedia of Science and Technology*.

2. In addition to our displays of technical resources, we also maintain an extensive pamphlet file, including many pamphlets geared to the needs of students who enjoy making and repairing things. "How-to-do-it" pamphlets dealing with automobile repair, home repair, cement work, furniture repair and re-finishing, and landscaping are some of the most used pamphlets in this file.

3. Further, we try to meet the technical student's reading needs and interests by maintaining an extensive, indexed vocational pamphlet file with pertinent information about hundreds of different jobs.

4. Finally, we also try to meet our technical students' diverse reading interests by having available books which they will read for recreation. Astonishingly varied, their reading tastes may range from the *Motor Handbook* to Sartre's philosophical essays.

After encouraging these students in their recreational reading, our real problem then becomes one of ordering and processing books fast enough to meet their new demands.

Librarians Should "Jump the Wall"

Community college librarians will find that once they "jump over the wall" of their liberal arts prejudices, work with technical students can be extremely satisfying and rewarding. Library-mindedness among these students is an objective which has urgent importance. While other college students can learn more about the library in their third and fourth years of college, technical students attend college for only two years. If we are to leave a lasting stamp upon these students, it must be done in our library and within the two years we are allotted. If we are successful, we will have produced a library-minded student who can effectively use any library, public or private for the rest of his life. We are sure that we can help to mold this kind of library-minded technical student by giving him friendly, professional guidance in his library problems and by co-operating closely with his technical and vocational instructors. And, in so doing, we will have attempted to fulfill the library's important function in furthering the aims of vocational education.

▶ A report on a study of **new and outstanding practices** in content and stress in the programs of our teacher education centers —

Trends in Teacher Education

RUFUS C. JOHNSON, JR.

Industrial arts teacher educators today are concerned with the need for frequent examination and appraisal of the philosophy and practices which motivate and direct various aspects of their professional programs. Certainly one means of evaluation and self-improvement is to observe existing and proposed practices in institutions engaged in comparable programs of education.

This report is an endeavor to present vital information about certain aspects of the work of selected industrial arts teacher education centers which may be valuable to similar institutions in the study and evaluation of their underlying principles and procedures. Information presented in this report includes some of the findings of a recent survey of colleges and universities by means of direct observation and personal inquiry. Personal visits were made to a total of 17 industrial arts centers located in 11 states.

It was believed significant and interesting to learn from industrial arts people what they considered to be a feature or special development in their programs. Some of their responses to this inquiry are described briefly in the statements grouped below.

Special Developments

In the opinion of this observer, there was evidence in every college visited of an outstanding effort on the part of industrial arts teachers to organize and arrange classrooms, tools, and equipment according to principles of efficiency and good housekeeping. *Shop organization and management* was stressed in the teaching programs. Great emphasis is being placed on *quality of work* in all phases of industrial arts teacher preparation. Numerous teachers and department heads said they are stressing as much as possible good design, craftsmanship, and professional skills. Students are being told to expect more critical evaluation of all their work. Although more employment in industrial arts teaching is expected, the competition for positions will be much greater in the years ahead. Most industrial arts students who were contacted individually on this survey seemed to possess a comprehensive understanding and conceptualization about the work they were doing, and about its relation to their professional development.

The sequence of courses as set up in various curriculums is followed as closely as possible. Prerequisites are frequently required for certain shop courses as well as for specialized professional courses. For example, in the area of woodwork or metalwork, fundamentals, intermediate, and then advanced courses are taken in that order. Specialized professional courses such as student teaching, methods or principles of teaching, and course making followed the basic courses in educational orientation, general and educational psychology, and in some instances history and philosophy of education.

Arrangements for some type of *general shop* experiences were considered most essential, and provided for in most colleges visited. Notable examples of well developed courses in industrial arts general shop activities were found at the State Teachers College, Gorham, Maine, State College, Millersville, Pa., Ball State Teachers College, Muncie, Indiana, and at the State University of New York Teachers College, Oswego. At Montclair State College, in New Jersey, all shop experiences are provided through the general comprehensive laboratory plan consisting of seven or eight areas.

A number of the industrial arts teacher education centers scheduled various *elective courses* in their departments for large numbers of students majoring in other college programs. This included students from fields of art, home economics, elementary, and secondary education.

Stress on Drawing and Design

Considerable variation was observed in content, teaching techniques, and in the amount of *drawing and design* required. Drawing requirements were found to be from 4 to 6 credits in a few programs, and 8 to 12 credits in others. In one teachers college a program for the preparation of mechanical drawing and design teachers requires 32 credits in this subject for certification.

One or two teachers are responsible for the courses in drawing and design in most industrial arts programs. At least one course dealing with principles of design is required in each program. Work covered in mechanical drawing and design courses includes graphic solutions and developments, orthographic projection, pictorial representation, auxiliary views and sectional details, technical sketching, design fundamentals, machine design, and architectural drawing.

Teachers of drawing and design seem to feel that students who enter industrial arts teacher education programs should be required to have at least a background in the care and use of mechanical drawing instruments, as well as some knowledge and skill in performing techniques of view drawing. Some teachers said frankly that fundamentals of mechanical drawing should be a prerequisite and, therefore, should be eliminated from the college teaching program. A few institutions have a policy that entering students are expected to have background in drawing and some shopwork. Related drawing and design is emphasized in the work of most shop courses.

Related Technical Subjects

Questions by industrial arts educators were frequently raised concerning needs of industrial arts students in *related courses*, such as science, mathematics, and language arts skills. Courses in both Physics and Chemistry are recommended as a requirement in industrial arts undergraduate programs. In a few institutions it was explained that no course in Mathematics is required in the undergraduate program; however, students who give low performances in the Mathematics section of entrance examinations are required to schedule one or more courses in college Mathematics.

Of special interest were innovations in *teaching techniques* and related

Dr. Johnson is professor of industrial arts, Cheyney State College, Cheyney, Pa.

requirements of students. Noteworthy developments in teaching shop classes in a number of places included Unit Project Work, Production Method Classes, and Industrial Arts Shop Experiments planned for junior and senior high school teaching programs. The industrial education department of the University of Maryland, for example, has made significant developments for a number of years in organizing materials and work in *Industrial Arts Experiments*.

Orientation courses (introduction to industrial arts) are conducted in about half of the institutions, for 2 to 4 credits. This work includes a study of the place and purpose of industrial arts in the educational program, requirements for a teaching career, and individual and group laboratory problems.

Starter projects were widely used in teaching various shop courses. The time involved in "starter projects" is relatively short and creative design and construction work are emphasized with basic hand tools. Participation and interest of students in this work appear to be on a high level. Connecticut State College at New Britain displayed interesting and challenging "starter project work" in several shops.

A practice encouraged in two state university programs, Ohio and New York, allows undergraduate credit for approved *summer work experience in industry*. Industrial arts teacher education recognize certain benefits that may be realized through various requests for *job service*, repair and production work, but they reported no particular program of exploration of students in any of the college centers. Many forms of mutual help between departments of the college have resulted in carefully planned and useful educational experiences. Budgets, where necessary in these situations, were available for paid student service and other help.

In most of the institutions visited on this tour *student teaching practices* were described as special features in the professional teacher education program. This experience is considered as a privilege and as the culminating activity for which industrial arts students must qualify. Requirements to enter this important phase of the program include interest in becoming a teacher, satisfactory achievement in specified major field course work, demonstrated skills in language and speech, and final approval of an application for student teaching.

In several colleges excellent arrangements were established on campus under public school supervision, and in other colleges all student teaching work was conducted in off-campus co-operating public school centers. The general pattern of student teaching experience falls under the stages of observation and partial participation, assistance to the critic or co-operative teacher, and full participation and full responsibility of a class group. Student teaching periods of six, eight, and ten weeks were reported most frequently. However, in some of the teachers colleges the time given to this experience was 16 and 18 weeks or a full semester.

Some institutions have two or three periods of student teaching for each industrial arts major. Where more than one period is required the first experience may come as early as the beginning of the junior year, or sixth semester. In a number of programs that require two periods of student teaching, the first session is usually scheduled in the seventh semester of college program. Industrial arts students usually return to the college classwork and completion of requirements for graduation. It was explained in several colleges that some of this work includes a final laboratory course in major shop activities.

The question of *supply and demand* in industrial arts teacher education was also discussed during this observation tour. It was noted that general shop teachers for secondary schools were reported in great demand in six states visited. However, in city school systems it appeared that the greatest demand was for industrial arts teachers with general unit shop preparation. School officials explained that industrial arts classrooms had to be closed in some public schools because qualified teachers were not available. In the past year colleges also report they were unable to fill many requests for industrial arts teachers in fields of electronics, power mechanics or, transportation activities, textiles, and graphic arts. Greater emphasis is being placed upon preparation of students in these fields. On the other hand, school officials in a section of Western Pennsylvania reported 30 new industrial arts shops in secondary schools opened this year. The same trend was mentioned in one section of New York State.

Industrial arts educators reported considerable demand on the part of their graduates and other in-service people for a *graduate program* of studies. All of the institutions visited except five offered the masters degree. Some of the industrial arts coursework offered for graduate credit features "high level" shop and laboratory testing and experimentation with industrial materials and processes, and special problems in research.

Nurturing Good Teachers

Observations and inquiries included also the basic issues of *employment, utilization and retention of industrial arts teachers* in the colleges and universities. In several places the writer asked industrial arts directors how they secure and keep good teachers. The general reply was that they try to provide necessary teaching facilities and work conditions, and to offer attractive salaries; in some places, special consideration for meritorious service is given.

A few teachers colleges have employed two full-time instructors in each shop area. In these industrial arts departments, shop teachers also teach a course in mechanical drawing and design related to the particular shop subject.

Several of the larger institutions reported as a special feature the availability and use of the teaching staff and facilities of engineering and other technical departments in offering course work and other experiences to industrial arts students. Some of the work taught by other departments was foundry, machine shop, electronics, mathematics, and technical drawing and design. A teachers college in the middle west explained that their industrial arts majors received excellent training in shop skills and in drafting through special courses scheduled in vocational and technical institutes.

There is a definite *organizational trend* in a number of states in joining the separate work of teachers colleges with larger educational programs of state colleges and universities. A number of advantages pointed out as a result of this trend include improved quantity and quality of students, teachers, and educational facilities, and in some cases, professional leadership. However, a few educators mentioned the possible disadvantage in the danger of less emphasis on the importance of teacher preparation in some subject fields.

This tour of selected industrial arts teacher education centers suggests both the importance of and need for more extended and more frequent observations. The experiences described in the foregoing summary were highly rewarding and stimulating, and fostered a better understanding and appreciation of the professional service of other industrial arts educators, and of the professional preparation of industrial arts students. In addition, the observation visits provided a privileged opportunity to raise questions and to exchange viewpoints on vital problems of mutual concern. This observation and interchange of ideas focused attention upon an analysis of current program features which, in many instances, will no doubt become future trends in industrial arts teacher education.

— Chase-Park Plaza Hotel

Previewing the AIAA in St. Louis

"Technological Advance and Industrial Arts" is the general theme of the 23rd annual convention of the American Industrial Arts Association which will be held April 5–7 at the Chase-Park Plaza Hotel in St. Louis, Mo. Presiding will be Ivan Hostetler, North Carolina State College, president of the association. Program chairman is Robert Swanson, Stout State College.

Built around the theme will be: (1) keynote speeches by James E. Russell, secretary of the Educational Policies Commission of NEA and Ray M. Karnes, University of Illinois, and past president of AIAA; (2) 15 discussion sessions on content, methods, and facilities; and (3) demonstrations and tours — all analyzing and illustrating what are and should be changes in industrial arts as influenced by the "advance" of technology.

Meeting with the AIAA will be the American Council of Industrial Arts State Association Officers, the American Council of Industrial Arts Supervisors, and the American Council of Industrial Arts Teacher Education.

On the following pages is an outline of the outstanding meetings and events planned for these groups along with a layout and list of exhibitors.

American Industrial Arts Association

WEDNESDAY, APRIL 5, 1961
1:30–4:00 p.m.

General Session: "Our Changing Technology"

Chairman: Robert Swanson, Professor of Industrial Education, Stout State College, Menomonie, Wis.

Hosts: John Gnagi, Clayton High School, St. Louis Mo.; Tom Mintle, Cleveland High School, St. Louis, Mo.

Welcome: Philip J. Hickey, Superintendent of Instruction, St. Louis, Mo.

Recorder: G. Harold Silvius, Professor and Chairman, Industrial Education, Wayne State University, Detroit, Mich.

Keynote Speaker: "Our Changing Technology" James E. Russell, Secretary, The Educational Policies Commission, National Education Association

Speaker: "Implications of Technological Advance for Education" George H. McCune, Professor of Social Studies, University of Minnesota, Minneapolis, Minn.

Speaker: "Implications of Technological Advance for Industrial Arts" Kermit A. Seefeld, Professor, Department of Industrial Arts, University of California, Santa Barbara, Goleta, Calif.

WEDNESDAY, APRIL 5, 1961
7:30–9:30 p.m.

Topic: Tour of Industrial Plant — Fisher-Body and Chevrolet Assembly Plant, 3809 Union Blvd., St. Louis, Mo.

THURSDAY, APRIL 6, 1961
8:30–9:30 a.m.

Topic: Business Meeting of American Industrial Arts Association

Presiding: Ivan Hostetler, President of the American Industrial Arts Association

Host: Emmett Perry, Ferguson High School, St. Louis, Mo.

THURSDAY, APRIL 6, 1961
9:30–12:00 noon

Topic: School Visitation — O'Fallon Technical High School

O'Fallon Technical High School will be open for individual visitation throughout the week. Arrangements for tours of other area schools can be made individually at the registration desk.

THURSDAY, APRIL 6, 1961
9:30–12:00 noon

Program Chairman: Hiram E. Grant, Professor and Head of Engineering Drawing Department, Washington University, St. Louis, Mo.

TOPIC *1.* "Breakdown of Orthographic Projection into its Basic Fundamentals" Orval B. Craig, Drafting Instructor, Maplewood-Richmond Heights Senior High School and Evening School Instructor, Washington University

TOPIC *2.* "Student Participation — Lecture Method (without blackboard)" J. W. Craig, Instructor of Engineering Drawing, Washington University

TOPIC *3.* "Effective Teaching from Incomplete Pictorials" William Aminger, Assistant Professor of Engineering Drawing, Washington University

TOPIC *4.* "Assembly Drawing Method of Teaching Dimensioning in Keeping with Industrial Practices" Forrest H. Whitworth, Department of Industrial Education, Maplewood-Richmond Heights Schools and Evening School Instructor, Washington University

president: **Ivan Hostetler**, North Carolina State College
past president: **M. Ray Karnes**, University of Illinois
treasurer: **Kenneth W. Brown**, Buffalo, N. Y.
executive secretary: **Kenneth Dawson**, Washington, D. C.
convention chairman: **Maurice Stewart**, Jefferson City, Mo.
program chairman: **Robert Swanson**, Stout State College, Menomonie, Wis.
convention director: **George H. Ditlow**, Lancaster, Pa.

TOPIC 5. Tour of $20,000 Industrial Displays showing major Industrial Tools and Gages — New Classroom Designs — Tour of well-organized and equipped Machine Shop

THURSDAY, APRIL 6, 1961
1:30–2:30 p.m.

Topic: "What Effects Should Technological Advance have on Industrial Arts?"

Program Chairman: Chris H. Groneman, Head of Industrial Education and Co-ordinator of Teacher Education, Agricultural and Mechanical College of Texas, College Station, Tex.

Hosts: Sam Hall, Clayton High School, St. Louis, Mo.; Gene Murdock, Roosevelt High School, St. Louis, Mo.

Recorder: William T. Sargent, Associate Professor of Industrial Arts, Ball State Teachers College, Muncie, Ind.

Speaker:..William J. Micheels, Professor and Chairman, Industrial Education, University of Minnesota, Minneapolis, Minn.

THURSDAY, APRIL 6, 1961
2:30–4:00 p.m.

PANEL DISCUSSION No. 1: "Should the Objectives for Industrial Arts Change?"

Discussion Group Chairman: Kenneth L. Bing, Director of Industrial Arts, East Carolina College, Greenville, N. C.

Hosts: Warren Henlon, Valley Park High School, St. Louis, Mo.; Richard Browne, McKinley High School, St. Louis, Mo.

Recorder: Welcome E. Wright, Professor and Head, Industrial Education, East Texas State College, Commerce, Tex.

Speakers:

John A. Jarvis, Dean, School of Industrial Education, Stout State College, Menomonie, Wis.

C. Blair MacLean, Chairman, Industrial Education, Michigan State University, East Lansing, Mich.

Norman C. Pendered, Associate Professor of Industrial Arts Education, Pennsylvania State University, University Park, Pa.

THURSDAY, APRIL 6, 1961
2:30–4:00 p.m.

PANEL DISCUSSION No. 2: "Should Organizational Patterns for Industrial Arts Change?"

Discussion Group Chairman: Marshall Hurst, Supervisor of Industrial Arts, Dade County Public Schools, Miami, Fla.

Hosts: Kenneth L. Evans, Affton School District, St. Louis, Mo.; Burton Chase, Southwest High School, St. Louis, Mo.

Recorder: Ralph C. Bohn, Acting Chairman, Department of Industrial Arts, San Jose State College, San Jose, Calif.

Speakers:

Ronald J. Baird, Assistant Professor, Industrial Arts Department, Ohio University, Athens, Ohio

Howard S. Decker, Head, Industrial Arts Department, Appalachian State Teachers College, Boone, N. C.

(Continued on page 46)

American Council of Industrial Arts State Association Offices

TUESDAY, APRIL 4, 1961
9:00 a.m.–5:00 p.m.

Theme: "Service: Role of State Associations"

Chairman: John R. Ballard

TOPIC 1. "As the Secretary Views ACIASAO"

Speaker: Kenneth Brown, Secretary-treasurer of The American Industrial Arts Association

TOPIC 2. "State and National Membership"

Speaker: William J. Wilkinson, Chairman, American Industrial Arts Association Membership Committee

TOPIC 3. "Attendance at State-Wide Conferences"

Speaker: John H. Koenig, Secretary, M.I.E.S.

TOPIC 4. "Future Problems of ACIASAO"

Discussion Leader: John R. Ballard

Business Meeting:

Presiding: John R. Ballard, President, ACIASAO

American Council of Industrial Arts Supervisors

TUESDAY, APRIL 4
9:00 a.m. to 10:30 a.m.

Topic: A Unified Approach to Industrial Arts Education

Chairman: Robert L. Woodward, ACIAS President and Consultant in Industrial Arts Education, California State Department of Education, Sacramento

Speaker: Marshall L. Schmitt, Specialist in Industrial Arts Education, U. S. Office of Education, Washington, D. C., *"Basic Purposes of Industrial Arts Education in the United States"*

Discussion: (The meeting will then divide into four sections to review material prepared for handbook on industrial arts education)

1:30 p.m. to 5:00 p.m.

SECTION 1: *Purposes and Program of Industrial Arts Education*

Section Leader: Edwin L. Kurth, ACIAS Vice-President and Assistant Director of Vocational, Adult, and Related Programs, Florida State Department of Education, Tallahassee

Resource Person: William M. Devonald, Director of Practical Arts, Newark, N. J.

Recorder: Earl Marihart, Director of Industrial and Adult Education, Dubuque, Iowa

Host: Vernon Duck, Co-ordinator of Industrial Arts and Vocational Education, Grand Junction, Colo.

(Continued on page 44)

who's who

Hostetler

Swanson

Ludington

Crow

Hornbake

Micheels

Seefeld

Helsby

DESIGN for the TEACHER

▶ Another in a series of articles on how to teach design in various areas of industrial education —

john r. lindbeck
Associate Professor of Industrial Education, Western Michigan University, Kalamazoo, Mich.

Craftwork and Industrial Arts

Craftwork, as an activity area of industrial arts, has certain purposes and aims which, unfortunately, are not too clearly defined. That it has a place in our curriculum is no great issue of doubt, but a precise definition of purpose is lacking. This dilemma, in part, is attributable to the varying opinions and approaches assumed by writers and practitioners of the crafts. Perhaps a consideration of some of these ascribed purposes will aid in clarifying the direction to be taken through craftwork.

1. The Purpose of Craftwork Is Decoration

Much has been said and much written on the subject of simplicity in design. Students have been discouraged from, "painting roses" on table tops because this embellishment is unnecessary to its function. The esthetic quality of the table should derive, in the main, from the characteristics of the particular material and from the form. To say, then, that the purpose of craftwork is decoration surely seems an anomaly. But in studying the various types of craft objects, it becomes evident that there is definitely a preoccupation with decoration. Leathers, ceramics, plastics, woods, metals — all are stamped, carved, etched, engraved, dyed, glazed and tooled, to the end that their appearance will be enhanced by decoration. Right or wrong, the situation exists.

Viewing this function from another direction, it is plain to see that many of the craft objects, whether decorated or not, are used for purely ornamental purposes. Wall plaques, figurines, and carvings fall into this category, as does jewelry which serves to adorn the person. In light of this, there are both decorated craft objects, and craft objects used for decorations. The function of any decoration in crafts is obvious. In ceramics, for example, some potters seek to give their work a distinctive and interesting appearance through the form or shape; some through the texture of the clay; others by the skillful blending and contrasting of glaze colors; and still others by drawing or painting glaze decoration on the clay surface. It becomes, in final analysis, the designer's choice; he chooses that medium or method which best allows him to express what he wishes to express.

2. The Purpose of Craftwork Is to Fulfill a Need for Objects Which Transcend the Anonymity of Mass Production

The history of machine production reveals the early attempts to put the machine to work duplicating the efforts of the hand. The brass sheet beaten into a wooden form to produce an ashtray can be stamped by machines in a fraction of the time required in the hand operation. The tedious hand engraving can also be done by the machine.

The point here is that many elegant articles can and are being mass-produced by modern industry. But there is, and always will be, a need for articles of an individual and original nature which are perhaps less likely to result from strict mass-production methods. There can be no doubt that such methods are the cornerstone of the American industrial system. It is, however, doubtful that an article can be other than "anonymous" when subjected to the production line, where one person performs one operation of the many necessary to manufacture it.

This purpose, then, is significant as it makes possible the creation of articles in which the designer and maker are one and the same person. Furthermore, the articles will be of an individualistic nature with something of the personality of the craftsman evident in each one.

3. The Purpose of Craftwork Is to Realize and Pursue the Inherent Potential in the Hand Methods of Producing Articles

This purpose bears directly upon, and is perhaps an extension of, the second purpose discussed above. But in this third purpose the primary concern is to take advantage of the possibilities of hand methods of construction or creation. The carving of objects lends itself better to hand than to machine skills. In like manner does ceramic tile work, leather tooling, metal and glass etching, and inlaying. The obvious is to concentrate the craft efforts toward the development of *hand*icraft skills, or at least design articles which utilize hand skills primarily and machine

skills secondarily. To completely disregard the possibilities in combining hand and machine skills would be foolhardy; when the opportunity presents itself for the use of the machine, use it. But, to reiterate, there is much which can be accomplished through hand skills and these should be thoroughly investigated.

4. The Purpose of Craftwork Is to Develop Hand Skills.

This approach to crafts, to use an overworked and redundant expression, is a typical industrial arts approach. There are those teachers who choose to concentrate their efforts toward this end, and to steer as clear as possible away from any mention of art or design. The teacher-planned or student-copied project, often in kit form, is the general rule in such situations. Craftwork instructors frequently defend this position by stating that the hand method, at least partially, precedes the machine method in industrial production. It is common knowledge that the model-maker in industry plays a significant role through his preparation of prototypes, models, and mock-ups. There is, therefore, truly great merit in developing a proficiency in the use of hand tools, but every effort should be made to have the student develop these skills while working on well-designed articles.

5. The Purpose of Craftwork Is to Develop Design Skills.

If, in accepting such a design approach to crafts, the teacher assumes that proper hand skills are learned concurrently, this purpose has great merit. But this is not always the case — and especially so in some art classes. The teacher who is long on design and short on craftsmanship does a disservice to the student. Due attention must be paid to the proper manipulation and use of tools; indeed, a short exercise to aid in the acquisition of skill has a place in craft work.

The above paragraphs treat only five of the goals of craftwork; a perusal of craft textbooks and articles, and discussions with craftwork teachers, will undoubtedly reveal others. The obvious question here is, "What should be the overriding purpose of craftwork in industrial arts?" Before answering this, one must understand and agree upon a differentiation between industrial arts courses in general and industrial arts craftwork courses in particular. In the common industrial arts course, i.e., woodwork, metalwork, etc., the effort should be concentrated upon the skills and knowledges pertaining to mass-manufacture as a truer, more representative picture of modern industry. Not every manipulative activity will culminate in a mass-manufactured article by the class, but some time should be given over to a discussion of multiple-production as it pertains to said activity.

If, however, the school curriculum includes a craftwork course to be taught in the industrial arts department, treat it as a true craftwork course. If it is structured as any ordinary industrial arts course, then don't call it craftwork because it isn't. The goals, in fact must be different. If the same objectives are treated in the crafts course as are treated in the woodworking course, then the courses should be revised. There should be no objection to an occasional reference to how industry might take a craft object, such as a turned salad bowl, and plan this for mass-production. This could be both informative and interesting to the student.

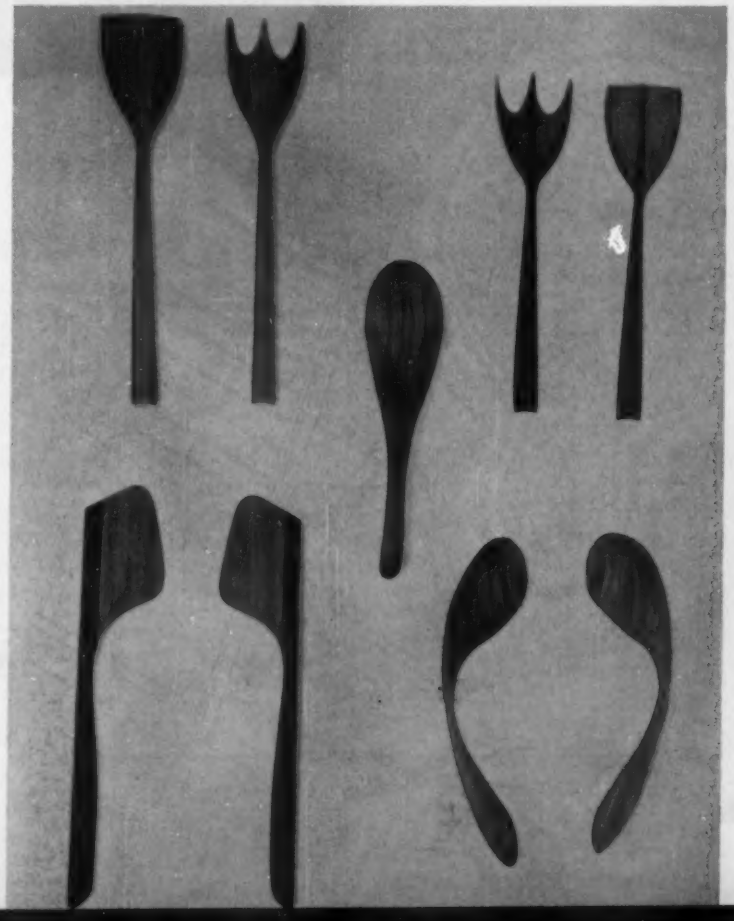
Which, if any, of the above purposes of craftwork should be embraced by industrial arts? Each has merit, each can be defended as being worthy of pursuit. Perhaps it is time that industrial arts accepts a single controlling purpose for craftwork: the creation of objects of a highly individual and truly personal nature, the "only one of a kind" approach, articles which fulfill a person's need for the extraordinary. Let the aim of craftwork be the making of objects which move beyond the anonymous nature of mass manufacture, an approach in which design and craftsmanship are treated as equals and where the ultimate is a student proficient in both designing and making — a true, "designer-craftsman."

Exemplary of this approach to craftwork is the designing and making of salad servers. As with all design tasks, one must first think of the function of these utensils, and consider the suitable materials. Wood had been selected as the medium for this problem.

Questions of use can lead to a specific shape or form for the servers. In the illustration one can see solutions designed to be used as a shovel, others to be held as one holds drum sticks, and still others to be used more conveniently while seated at the table. Experimenting with these ideas sparks any number of creative solutions.

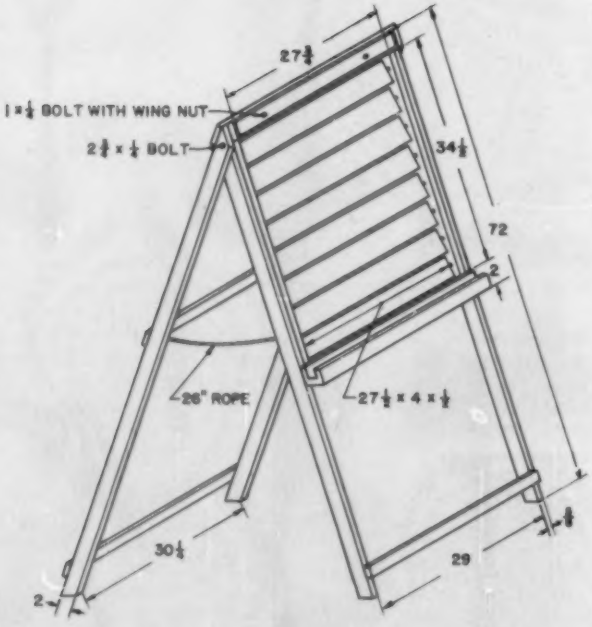
Working from sketches, the wood is cut to a rough shape on the bandsaw and then more carefully worked with knives, rasps, chisels, or any other suitable tools. Such forming can be likened to wood sculpturing, where the objective is to produce a server of elegance and grace.

Note the good use of teak and ebony in two of the sets, a combination which provides an interesting feature of contrast. The graceful contours, the original shapes, the sensitive combinations, and the craftsmanship as evidenced in these pieces are examples of what can and should be done in craftwork. ◀



A MULTI-PURPOSE TEACHING AID

PETER E. TOBIA
Trade and Industrial Education Adviser
USOM-Nicaragua



"Necessity is the Mother of Invention." This old and familiar refrain is certainly appropriate in the case of designing and making the multi-purpose teaching aid. In January, 1960, the industrial arts and home making section of the Ministry of Education of Nicaragua in co-operation with the Education Section (SCIEP) USOM-Nicaragua, planned a vacation period in-service teacher training program. Plans were to conduct a three-week seminar which would include techniques of teaching, and preparation of teaching aids and materials. Both of these areas required a number of hours of classroom work. The supervisors of the industrial arts and home making section were to be the teachers in the seminar and they planned to use many different visual aids in their instruction, such as flip charts, "strip-tease" charts, "venetian blind" charts, regular kinds of charts, maps, the blackboard, the flannel board, models, and many others.

A check was made of the classrooms which were alloted to us in the school where we were to conduct the seminar and we found a blackboard in each classroom. Lacking, however, was something that could be used effectively for holding our charts, flannel board and other visual aids. We were then faced with the necessity of designing an aid to serve our many purposes.

The multi-purpose teaching aid was the result. The aid is first of all a folding stand that can be easily carried and set up by the teacher. On the top there are two bolts with wing nuts for fastening flip charts in place. Immediately below this are seven pieces of wood which is the "venetian blind" part of the aid. On these pieces you can put strips of paper with key words or items of your lesson outline. These strips would be put on before the class started and then placed in the open position so that the outline could not be seen. As you develop your lesson, the pieces of wood are turned exposing the key words or items in your outline. Immediately below this is a tray where the charts, flannel board, blackboard and other aids can be placed. After you have completed your class, all you have to do is to fold it up and you are ready to take it off to your next class or store it.

▶ Try caricatures to take the routine out of exercises on —

USING THE RULER

JOSEPH A. THOMAS
Ridgewood Junior High School
East Irondequoit Central School District No. 1
Rochester 22, N. Y.

Our school has seventh and eighth grade students only, and all boys have one period daily of industrial arts for a period of twenty weeks. We offer work in woodworking, ceramics, textiles, printing, electricity, and art metal.

We do not, of course, attempt to teach any mathematics, except as it might be incidental to a particular shop problem and we only try to explain for a more clear understanding of a particular problem that involves computations. We do feel that understanding, and being able to accurately perform line measurements, whether it be on paper or with shop materials, should be a very important part of a student's background. We know that all industrial arts instructors feel as we do about this matter. Many students, at least junior high school students, do not attach much importance to the necessity of being able to use and read a ruler correctly. And if they do perform creditably in the classroom, they do not transfer this skill to the measuring of lumber, or band iron, or sheet metal, etc. Measurements are usually called off as "about 2/8ths, or about 4/8ths, or about 5 and 6/8ths, etc."

To give our boys in the shop practice in measuring (knowing how they dislike anything that seems of the routine) we use line figures that add a touch of novelty and interest to the lesson. These exercises, nonetheless, give the necessary practice in the reading of line measurements. The caricatures take the "routine" out of the exercise.

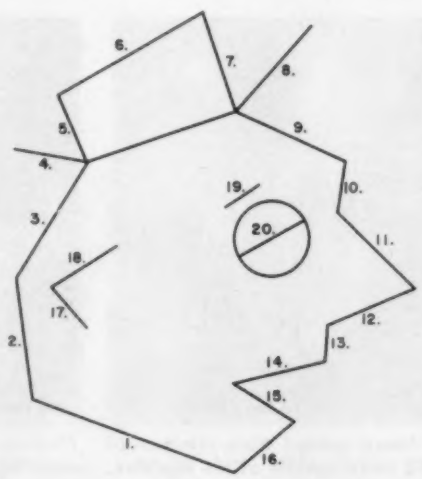
The line figures could, of course, be arranged to interest any of the junior high school students. ◀

RIDGEWOOD JUNIOR HIGH SCHOOL
EAST IRONDEQUOIT, NEW YORK
INDUSTRIAL ARTS DEPT.

DATE_____ STUDENT_____

SECTION_____ TEACHER_____

DIRECTIONS: USING YOUR RULER, MEASURE EACH LINE THAT MAKES UP THE FIGURE SHOWN ON THIS SHEET. THESE LINES ARE NUMBERED FROM 1 TO 20. PLACE YOUR ANSWER ON THE BLANK LINES PROVIDED ON THE RIGHT SIDE OF THIS SHEET. USE NUMBERS AND THE SYMBOL FOR INCHES (") SUCH AS, 1"--- 1½"--- 2" ETC.



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AUTOMATIC MACHINING IN THE SCHOOL MACHINE SHOP

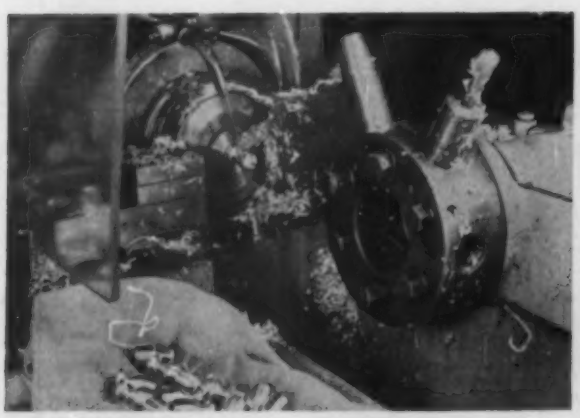
H. J. GERBER

Formerly Assistant Professor and Head of Machine Shop Department
The Technical Institute, College of Engineering
Oklahoma State University, Stillwater

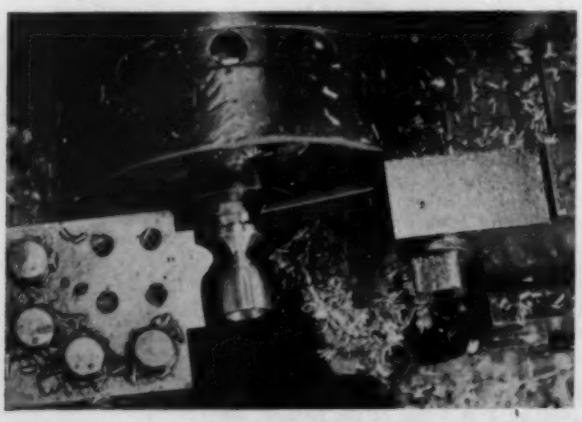
We are becoming aware of the great evolutionary process which has been going on in our mass production industries. These automatic production systems have been designated in the popular press by the magic term "automation." This word, virtually unused 15 years ago, describes all the processes of automatic machining, automatic assembly, and automatic inspection of mass produced consumer products—products ranging from automobile engines to lightbulbs. These separate processes are often correlated into one huge sequence of automatic production line flow. Such "transfer machines" often tie together automatic turning, milling, broaching, grinding, and other basic processes by the use of electronic control systems.

This system of manufacture is, in these times of high wage costs, becoming an absolute economic necessity. It also threatens us with certain sociological problems due to gradual elimination of the masses of semi-skilled machine tool operators which have made up such a large proportion of our metal trades labor force. Certain forward looking labor unions and enlightened industrial leaders have already undertaken retraining programs to prepare their workers for the new skills which will be involved in the tooling up and maintenance of these automatic processes. In view of these facts, do we as educators have not some responsibility for assisting in the indoctrination of our vocational and industrial arts students in at least some of the principles and techniques of modern manufacturing practice?

Although the automatic machining of metals, only a part of the whole sequence of automation, is a very intriguing technique to machine shop students, they seldom have an opportunity to work with machines of this sort



A nearly completed cup being parted from the bar of stock held in a collet in the head spindle of the machine. Cutoff tool is mounted on the cross slide. Note the simple tooling setup in the turret at the right. Only two stations are used; a length top and drill.



Closeup view of the cross slide tooling. A high speed steel form tool is located on the front slide and a cutoff tool is seated on the rear slide.

while they are in school. The machine shop at Oklahoma State has for the past 12 years included a unit of experience in automatic turning processes. To do this use has been made of the automatic screw machine, an invention by no means new but still considered to be the most basic of the automated metal removal machine tools.

The automatic screw machine is basically an automatically controlled turret lathe which incorporates most of the purely mechanical methods of control of cutting tool action with the automatic feed of stock and automatic ejection of finished work. This single machine, which makes use of most of the principles of kinematics, is the machine shop's most dramatic example of the possibilities of gears, cams, feed screws, levers, etc., for the automatic control of a complex sequence of movements.

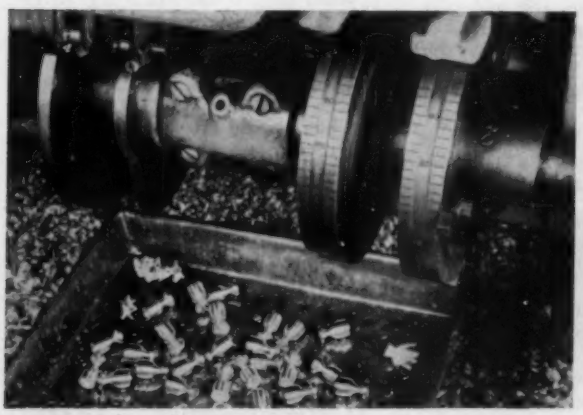
In our shop we have two single spindle automatics[1] of quite ancient vintage which were given to us free of charge. These machines are about 35 years old and had been discarded by the previous owners, but, despite their age, they incorporate all of the basic mechanical principles possessed by more recent models.

Industry usually considers it uneconomical to tool up an automatic machine unless the production run will number in the thousands of pieces. Therefore, it is natural for the machine shop teacher to puzzle over just what product he would be justified in producing if he did have such a machine, particularly as he becomes aware of the terrific rate at which the machine eats up material — a 12 ft. bar of stock disappearing in 30 minutes or less. We arrived at a practical solution to this problem. For many years the institute, as an advertising and good will gesture, has distributed a miniature trophy cup to every person visiting our department. Thousands have been given to such visitors, many who have come in large groups for various campus activities, Even at the production rate of one cup every 14 seconds, at certain times, a constant line of eager visitors have waited to observe the operation of this interesting machine tool and be given their souvenir cup as it comes through the entire process from raw stock to completion.

This souvenir cup was a relatively simple object to tool up for, but it did involve the design and machining of a number of cams, the making of form tools and special tool blocks as well as the adjustment, timing, and setting of the mechanical movements of the machine. An allotment has usually been obtained from the promotional budget to cover the cost of materials for this activity. The stock was 24ST aluminum bar stock of 5/8 in. diameter, it was fed to the machine in 12 ft. bar lengths. So far over 20,000 of these small cups were distributed to persons observing this intriguing machine in operation. Since, for most of the visitors, this is their very first glimpse of at least one of the most basic of the automation processes about which they have read, the project should contribute to public understanding of how this effort plays in the vocational education of the young people of our state. To improve the advertising value of this trophy cup we are planning the early installation of a "trademarking" roller die which will roll mark the name of our institution around the base of the cup. Tooling for this operation has been designed and built to function as an overshot operation to just slightly precede the cut-off step in the automatic sequence.

During the course of the school year the machine is in frequent use. It is operated at regular intervals in the routine instruction of classes as well as periodically for the benefit of groups of interested visitors. The machine is being re-built for operation on shorter run jobs, primarily to provide varied tooling and setting up practice for advanced production machine shop classes. ◀

[1]The question of cost need not make the machine shop teacher hesitate to consider acquiring a machine of this sort. Used machines in good condition are available at no more cost than a used milling machine or engine lathe. Indeed, small machines in "as-is" condition sell for as little as $250. Your students can re-build the machine as a class project.

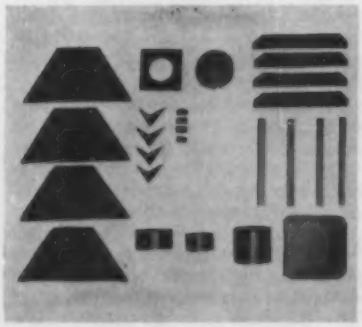


Closeup of portion of cam shaft on front of the machine. The two place cams at the left control the action of the two cross slides. Completed work pieces are ejected into the pan below through use of a delivery chute which is also cam controlled to separate chips from the work pieces. The trip dog wheel at the right controls the thrust indexing.

View of the front of the machine showing complete cam shaft.

OPERATION LAMPLIGHTER

DEAN H. HESS
Instructor in Metals
St. Clair, Mich., High School



Above: layout of the parts needed to complete "operation lamplighter." Below: a jig to hold the base, rail, etc., in place for soldering.

Lamps have played an important part in the history of man. After man passed from the torch stage he perfected lamps that emitted a warm glow and reflected the artisan's skill in metalwork.

This lamp provides the student with a wide variety of work experiences, plus a functional item which, when completed, can either be used personally or as a gift.

A simple jig was made to hold the base, rails, and corner supports in proper position for soldering. A certain degree of error can be made in layout and cutting and still be compensated for by the use of such a jig.

Spin cupola top from any solderable material. This job is small enough to be done on a metal lathe modified for spinning. This is a highlight for the students in the construction of this lamp.

Standard porcelain light bulb base and glass chimney were purchased for about 70 cents, and glass panels were purchased for about 50 cents a set (these were pre-cut from a local hardware). Glass could be cut in the shop to reduce expenses but this presents problems.

This lamp is electric although with little modification it could be converted to gas light.

The Assembly procedure for the top:

1. Lay out, cut, and fold to shape all parts.
2. Position and solder roof quarter sections into position.
3. Position and solder roof top.
4. Position and solder dormer vents.
5. Solder cupola top to vented cupola pipe. (This should be done with a torch.)
6. Position and solder cupola assembly to roof.

Assembly procedure for bottom:

1. Lay out, cut, and fold all parts.
2. Position base, corner supports, and top rails in jig and solder.
3. Position and solder chimney base.
4. Position and solder post socket. (Caution should be taken not to overheat and soften solder holding chimney base.)
5. Solder roof hold down nuts into place. (These should be brass.)

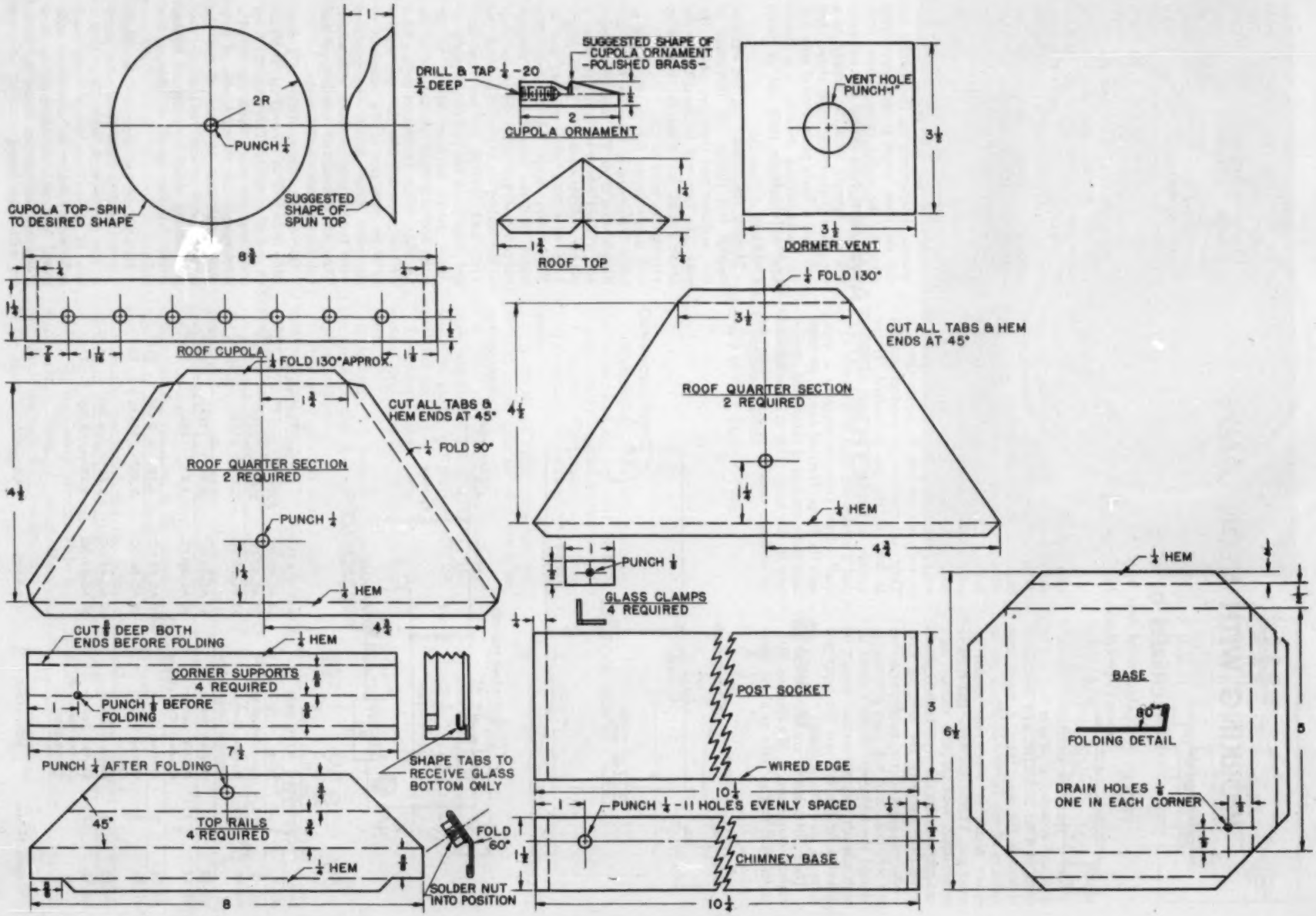
Caution should be taken to insure that glass contact surfaces are free from access solder to prevent binding and cracking of glass.

When lamp is assembled and all excess solder removed it should be cleaned, primed, and painted a flat black.

With proper presentation, this lamp provides a highly competitive project for your students designed to bring out skills that would otherwise remain hidden.

BILL OF MATERIALS

Quan.	*Materials*	*Size*
4	22 ga. galvanized iron	5 x 9½"
1	22 ga. galvanized iron	3½ x 3½"
4	22 ga. galvanized iron	1½ x 3½"
1	22 ga. galvanized iron	4 x 4"
1	22 ga. galvanized iron	1¼ x 9¼"
4	22 ga. galvanized iron	2⅜ x 8"
4	22 ga. galvanized iron	1¾ x 7½"
1	22 ga. galvanized iron	6½ x 6½"
1	22 ga. galvanized iron	3 x 10¼"
1	22 ga. galvanized iron	1½ x 10¼"
4	22 ga. galvanized iron	½ x 1"
1	round brass stack	½ x 2"
5	¼" — 20 brass machine screws	
4	¼" — 20 brass nuts	
4	½" No. 6 sheet metal screws (cadmium plated)	
4	glass panels	7½ x 7"
1	glass chimney	
1	porcelain lamp base	

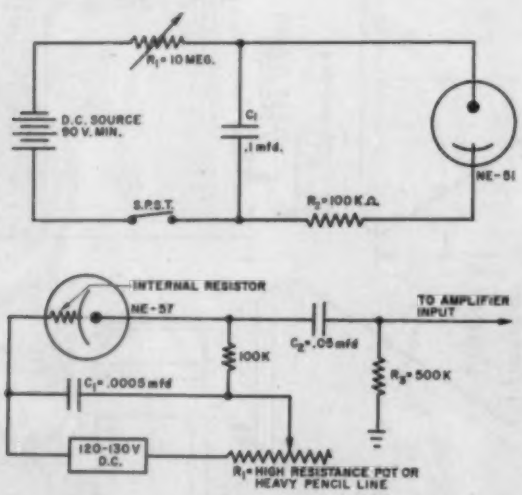

1
2R
PUNCH ¼
CUPOLA TOP-SPIN TO DESIRED SHAPE
SUGGESTED SHAPE OF SPUN TOP
DRILL & TAP ¼-20 ¾ DEEP
SUGGESTED SHAPE OF CUPOLA ORNAMENT -POLISHED BRASS-
2
CUPOLA ORNAMENT
VENT HOLE PUNCH-1"
3½
3½
DORMER VENT
1½
1½
ROOF TOP
8⅜
¼
¼
1½
⅜
1⅛
1⅛
ROOF CUPOLA
¼ FOLD 130° APPROX.
¼ FOLD 130°
3½
CUT ALL TABS & HEM ENDS AT 45°
ROOF QUARTER SECTION 2 REQUIRED
4½
1½
¼ HEM
4¾
CUT ALL TABS & HEM ENDS AT 45°
¼ FOLD 90°
ROOF QUARTER SECTION 2 REQUIRED
4½
PUNCH ¼
1½
¼ HEM
4¾
1
½
PUNCH ¼
GLASS CLAMPS 4 REQUIRED
¼
CUT ⅜ DEEP BOTH ENDS BEFORE FOLDING
¼ HEM
CORNER SUPPORTS 4 REQUIRED
1
PUNCH ⅜ BEFORE FOLDING
⅜
⅜
7½
PUNCH ¼ AFTER FOLDING
45°
TOP RAILS 4 REQUIRED
¾
¾
¼ HEM
⅜
⅜
8
SHAPE TABS TO RECEIVE GLASS BOTTOM ONLY
FOLD 60°
1½
SOLDER NUT INTO POSITION
POST SOCKET
3
6½
WIRED EDGE
10½
1
PUNCH ¼ -11 HOLES EVENLY SPACED
½
½
CHIMNEY BASE
10½
¼ HEM
BASE
60°
FOLDING DETAIL
DRAIN HOLES ¼ ONE IN EACH CORNER
5

WORKING WITH NEON LAMPS

CHARLES O. ROSS
Industrial Arts Instructor
Senior High School, Jonesboro, Ark.

One of the most interesting, instructive, and economical objects that can be used in your industrial arts electricity classes is the neon lamp. A neon lamp consists of two electrodes, which can be either plates or wires, surrounded by neon gas. This is the same gas used in neon signs. When a d.c. voltage high enough to ionize the neon gases is placed across the terminals the negative electrode will glow. If a.c. is placed across the terminals both will glow alternately. Should the frequency of the current be high enough this alternation cannot be detected by the eye and the lamp will seem to glow continuously.

These little lamps are economical in current consumption, drawing as little as 1/25 watt and as large as about three watts. Their life is exceptionally long and they never burn out — they just get dimmer. Neon lamps produce very little heat and are not subject to shock and vibration as are incandescent lamps. Neon lamps are similar to all gas filled tubes as they conduct current at a given point. This point is the exact time at which the voltage across the terminals is sufficient enough to ionize the gas. They will continue to conduct current as long as the gas is ionized. If the voltage is increased to such an extent that it causes the lamp to run away with itself (draw excessive current) it damages the lamp. Then, of course, we must have some method of controlling current flow in the lamp. This is accomplished by wiring a resistor in series with one of the lamp terminals. The lamps with screw type bases have a resistor wired into their bases.



LAMP	CURRENT	TYPE BASE	START VOLTAGE	SERIES RESISTOR		
NE-2	1/25	Wires	65 AC-90 DC	200K[1]	750K[2]	1 Meg.
NE-45	1/4	Candelabra Screw	65 AC-90 DC	30K*[1]	82K[2]	120K[3]
NE-48	1/4	Double Contact Bayonet Candelabra	65 AC-90 DC	30K[1]	110K[2]	150K[3]
NE-30	1	Medium Screw	60 AC-85 DC	4.8K*[1]	13K[2]	18K[3]
NE-32	1	Double Contact Bayonet Candelabra	60 AC-80 DC	4.8[1]	18K[2]	24K[3]
NE-34	2	Medium Screw	60 AC-85 DC	3.5K*[1]	9.1K[2]	13K[3]
NE-36	2	Skirted Double Contact	60 AC-85 DC	3.5K[1]	11K[2]	16K[3]
NE-40	3	Medium Screw	60 AC-85 DC	2.2K*[1]	6.2K[2]	8.2K[3]
NE-42	3	Skirted Double Contact Bayonet Candelabra	60 AC-85 DC	2.2K[1]	8.2K[2]	11K[3]

*Resistor in base. [1]105v.–125v. [2]250v.–300v. [3]300v.–375v.

Have you noticed the blinker signs along highway construction projects? These signs contain neon lamps, as do many signal devices. A simple circuit illustrating the blinker effect would consist of a d.c. power source of at least 90 volts, a variable resistor, a condenser, and a neon lamp with the proper resistor in series with one of the terminals.

In the accompanying drawing, the condenser C1 starts charging as soon as the circuit is closed. When the voltage across C1 reaches the firing point of the lamp it conducts (blinks) and discharges C1. The condenser C1 then starts charging again to repeat the cycle. The time between the blinks of the lamp is controlled by varying the resistance in the circuit at the variable resistor R1.

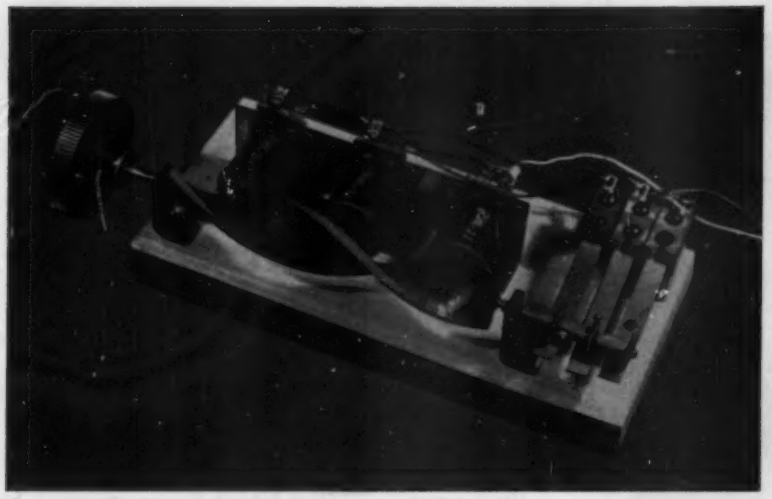
Many of the low priced electronic musical instruments on the market today use neon lamps as oscillators operating in the audio range. These little lamps have their faults and naturally will not operate with the fidelity of a complicated electronic tube circuit, but will give a fairly pure musical note. On the accompanying drawing is a circuit that will illustrate their use as audio oscillators.

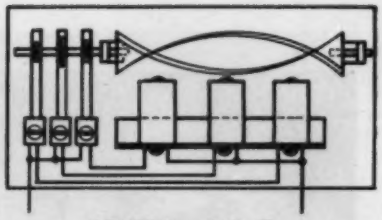
Moving the contact on the variable resistor will change the frequency of the oscillator and therefore change the note. The tone will be flutelike for the above circuit, but it can be changed by varying the value of C1.

A handy device for the electrician or home repairman is a circuit tester utilizing a neon lamp. The materials needed are: 2 short pieces of insulated wire; 2 plastic ballpen cases; 2 phone plugs; 1 ½ watt 200k ohm resistor; and an NE-2 neon lamp. To construct this tester: pull the insulated wire through the pen cases and solder the phone plugs to the end of each wire. Now, pull the wires back through the pen case until the plugs touch the end of the pen case. Apply model airplane cement to the plugs and pull them into the end of the pen case. Allow 15 minutes drying time for the cement. Solder the 200k resistor in series with one of the terminals of the neon lamp. Attach the insulated wires to the lamp terminals with solder. Tape all uninsulated connections and you have a handy circuit tester.

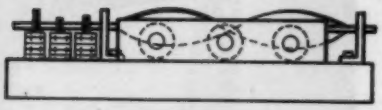
One of the characteristics of a neon lamp is its lack of thermal lag. It blinks on and off instantly. This gives the lamp a stroboscopic effect. With the aid of a stroboscopic disc the turn table of your phonograph can be checked for the proper speed or can be used to stop any moving object by using the blinker circuit at the speed of the moving object.

Listed here are some of the things you will need to know about neon lamps if you are to work with them. Buy a few of these little lamps from your radio supply dealer and experiment with them. You will be surprised at how much interest you can arouse by working with neon lamps.





GENERAL LAYOUT



MATERIALS

STRIP IRON- ARMATURE
BRACKETS SHAFT
STAINLESS STEEL - .015 CONTACTS
COIL BRACKET
CONTACT SEPARATOR-FIBERBOARD
SHAFT- HARDENED STEEL

TWISTED ARMATURE MOTOR

C. DAVID GIERKE

Student, Industrial Arts Education Division
College of Education, State University of New York, Buffalo

This simple motor operates on the principle of electromagnetic attraction upon a ferrous material which, by means of a mechanical timing device, creates circular motion in an armature. This motor can be a terrific teaching aid, especially in the elementary electricity situation where a child can actually see the exciting aspects and possibilities of electronics. This device demonstrates one of many possibilities which may be incorporated through the use of the electro-magnet.

The motor presented here is basically in the simplest possible form. Many modifications may be installed to improve its efficiency and power. A few of these modifications might include: change from contact control to commutator; add electro-magnets so as to surround the armature, and thus increase the power; devise a reversing unit so that the full capability of the motor may be attained, etc.

Another interesting sidelight to this motor is the fact that it will operate on either a.c. or d.c. supply. This, of course, is possible because electro-magnets do not distinguish the differences in polarity while attracting ferrous materials. It should be noted, however, that d.c. is slightly higher in efficiency than a.c. at the same voltages because of the time lag which possesses a.c. during polarity change.

This motor also offers possibilities to the advanced electrical student, in that it would serve as an excellent research project as mentioned above.

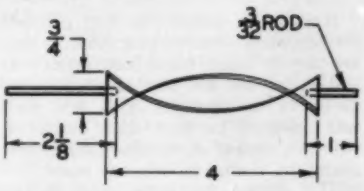
Construction Notes

1. Eighteen-volt coils were used for this motor, but any coil may be used to your own voltage requirements.
2. Contacts were constructed from .010 in. spring steel with silver contact points.
3. A .02 to .05 MMF capacitor was installed across each set of contacts to prevent arcing.
4. Cams were made from fiberboard discs which were trimmed to the approximate shape, and press fit into the armature shaft.
5. Armature shaft may be either pressed into armature, or soldered into place.
6. Armature was bent in a vise with the use of a pipe wrench to twist the required number of turns.
7. Brackets (optional) were installed with brass bearings.

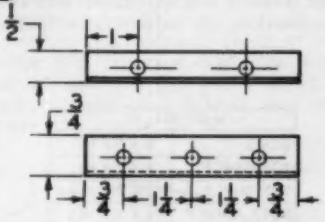
After the motor has been assembled, the cams must first be adjusted before it will operate correctly. From study of the drawings, you will observe that the armature is located slightly above the center line of the coils. This is to permit the electro-magnets to pull the lower segment of the armature to its nearest position at the coil, thus creating the rotation of the armature.

The writer has found that the best position of the cam (which closes the contact and completes a circuit) in relation to the segment of armature, which is directly in front of the energized coil, should be vertical (approximately) to the base.

1 ARMATURE

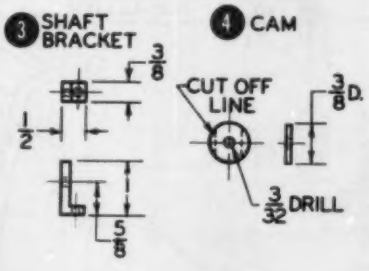


2 COIL BRACKET

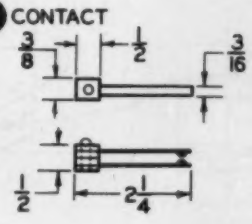


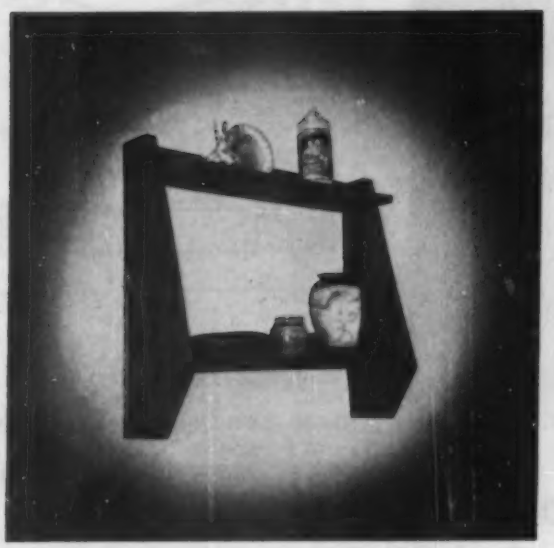
3 SHAFT BRACKET

4 CAM



5 CONTACT





CONTEMPORARY WALL SHELF

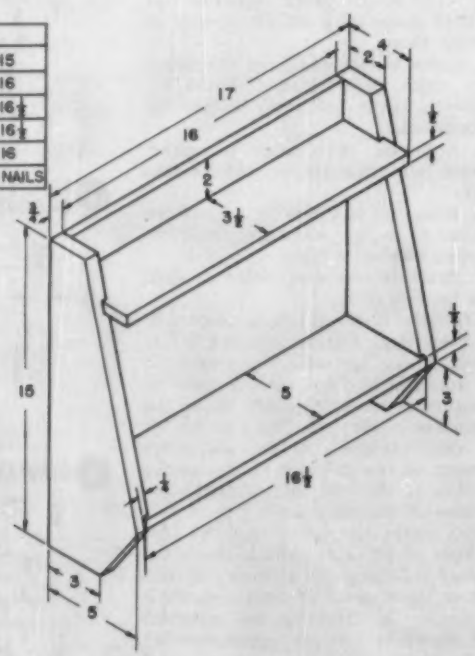
JEROME A. SOMMER
Industrial Arts Instructor
Washington Junior High School, Racine, Wis.

It is often difficult to find projects for beginning woodworking students that are easy to make, teach basic operations and skills, and are also interesting and useful to the students. This wall shelf was designed to meet these needs. It will fit a variety of furniture styles and, therefore, should fit into any home.

The project has been used in two junior high schools by four instructors in ten week long, eighth grade classes. The students in these classes are taking woodworking for the first time. Students who have difficulty getting the pieces to the correct size will still end up with an attractive shelf due to the independence of the members of the project.

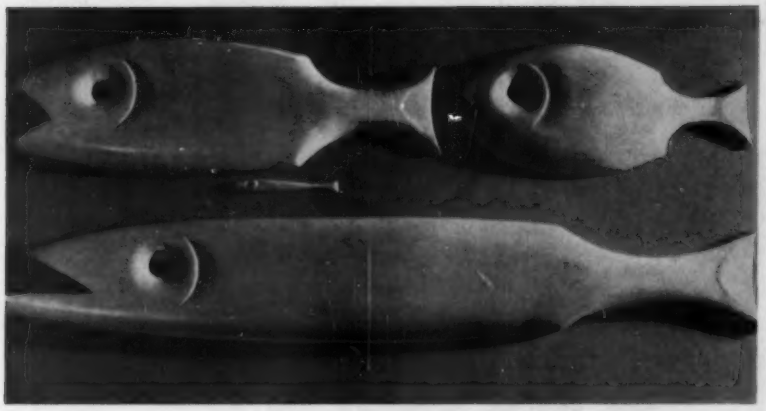
Our students begin with rough lumber and study basic procedures, tools, and materials as they build the shelf. Procedures include squaring the stock, simple layouts, making a dado, nailing, and finishing. Tools studied include planes, layout tools, drills, and hammers. Materials studied include common woods, fasteners, abrasives, and finishes.

MATERIALS	
SIDES	¾ × 5 × 15
TOP BRACE	¾ × 2 × 16
TOP SHELF	¾ × 4 × 16½
BOTT. SHELF	¾ × 5 × 16½
BOTT. BRACE	¾ × 3 × 16
18 4D 1½	FINISHING NAILS



The Procedure

1. Make a bill of material. (A list of pieces plus their finished and rough sizes is all that is needed at this level.)
2. Plan the procedure. (This is done as a group because the students have no previous experience. Also discuss common woods.)
3. Take out rough stock. (At this point discuss saws, economical use of wood, warping, etc.)
4. Square up stock. (Use all hand operations. The order of surfaces done is face, edge, end, end, edge, and face except for the sides. The sides are not squared in the usual order due to the tapers. Discuss planes.)
5. Lay out, cut, and square tapers. (Discuss layout tools at this time.)
6. Lay out and cut dados. This gives the student an opportunity to make an accurate layout and follow it with careful joinery. (Use a back saw and router plane to make the dados. Discuss joints.)
7. Locate and drill nail holes. (The holes are drilled through the sides to prevent splitting the wood when nailing. The shelf will be stronger if the nails are driven at an angle. Discuss fasteners and drilling.)
8. Smooth. (Discuss abrasives.)
9. Assemble. (The drawing and picture show only a top brace. This is all that is needed on a well constructed shelf. For extra strength and rigidity, add a bottom brace.)
10. Prepare for finishing. (Fill the nail holes and smooth surfaces to be finished.)
11. Finish. (By using a wood like black willow, a variety of finishes can be obtained to meet individual needs. The procedure is to stain, seal, and varnish. Smooth with a fine abrasive between coats of varnish.)



DECORATIVE FISH

W. BEN HUNT
Hales Corners, Wis.

These stylized fish should look good in a den or recreation room right above rod or reels. Or perhaps the young woodworker's parents have a summer home which could stand some decoration.

They may be made any size. These are laid out in 1 in. squares which make the musky 25½ in. long. The wood was some very clear ¾ in. white pine without any perceptible grain. Bass or clear birch would be as well. An interesting mobile could be made with them also but in that case I would suggest using 1 in. wood, as both sides would have to be whittled.

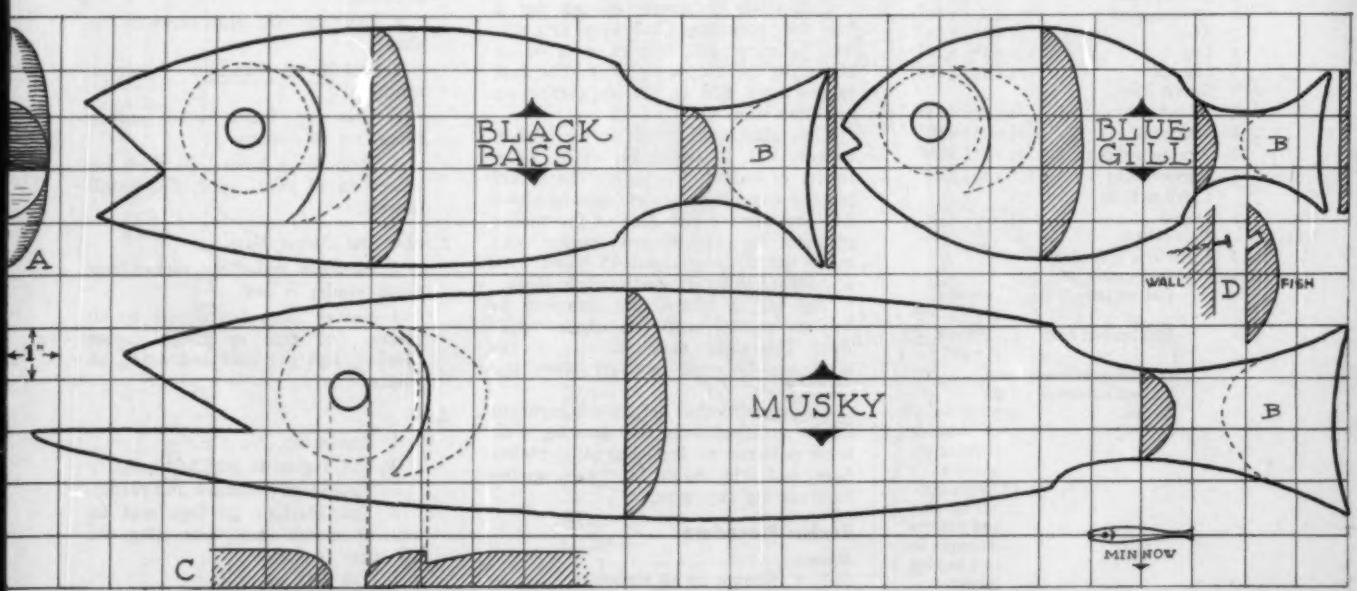
After determining the size, cut them out on a band or jig saw and drill the eye holes. These are ⅝ in. Then round up the bodies as indicated in the sections, using a spokeshave or a jackknife or both. The heads are all made like the end view at "A." Note that the tails are flattened at "B" as shown by the dotted lines. The eyes and gills are whittled as shown in the section marked "C," but they and the tail should not show decided edges. Rather they should "run" out smoothly into the body.

To get a smooth, even surface, a sanding stick is almost a must, since it rounds off all the slight depressions and uneven places nicely.

If the fish are to be hung on a wall, drill two slightly slanting holes in the back of each as shown at "D." Then they will hang even and flat on two small nails driven into the wall. (Fish when resting are, as a rule, on an even keel.)

The fish were given a coat of cut shellac and, when dry, were rubbed off with a soft cloth. The final finish was two coats of spar varnish and one coat of semigloss varnish.

Perhaps you don't care for these particular fish. However, using the same general idea you can easily design a walleye, trout, or whatever you like better.



SWIVEL ROCKER

JAMES ZEASMAN

Mt. Horeb, Wis.

BILL OF MATERIALS

Quan.	*Description*	*Size*
2	Seat sides	¾ x 7½ x 27"
1	Seat back rail	¾ x 3 x 19½"
1	Front rail	¾ x 7½ x 19½"
1	Front rail thickner	¾ x 2 x 19½"
2	Back sides	¾ x 4½ x 25½"
1	Back top rail	1½ x 3 x 19½"
1	Back bottom rail	¾ x 3 x 19½"
3	Rear stringer	¾ x ¾ x 19½"
8	Glue blocks	1½ x 1½ x 3"
2	Rocker base	2 x 2¼ x 12"
2	Arm support	2 x 2 x 15"
2	Arm	2¼ x 3 x 24"
4	Leg	1½ x 3½ x 10"
2	Leg rail	1½ x 2½ x 18½"
	Swivel base	
2	long rail	¾ x 2½ x 19½"
4	side rail	¾ x 2½ x 10"
2	center support	¾ x 2¼ x 10"
8	glue blocks	1½ x 1½ x 2"
	Carriage bolts	¼"
	Dowel	⅜"
	Swivel base	8"
1	Lightweight double rocker spring	
	Cotton felt	1", approx. 5' 27"
	Rubberized hair	1", approx. 5' x 24"
	Burlap or canvas	2 x 4'
	Cotton subcover	2 x 4'
	Fabric	approx. 1½ yd. 54" wide depending on pattern (Always lay out for size and pattern on paper before buying fabric)

A very popular and impressive project which is commonly made in the upholstery area of the author's high school shop, as well as in the evening adult class, is this swivel base platform rocker.

This chair is simple enough for a first year sophomore industrial arts student to construct. The chair is of an attractive contemporary style. The cost ranges from $20 to $25 depending on materials used.

The illustrated chair is a swivel rocker, but it could be made as a rocker or swivel chair only. The swivel plate is a commercial item costing about $1. The same is also true of the rocker springs. An experienced worker can make the chair in about 15 hours with a student taking proportionately longer.

The leg is located by clamping in various places until the chair "sits" right. This allows each individual to get his most personal comfort from the chair.

The construction details are included in the attached bills and drawing. Full scale patterns of legs, leg rails, rocker base, and arm should be drawn up before cutting any wood.

Rocker Procedure

Frame

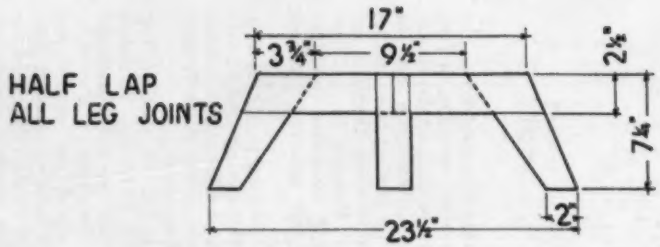
1. Square up all members.
2. Half lap seat and back side members (both sides right or left will save time) glue up, bolt with 3 — ¼ in. carriage bolts later.
3. Cut angle on front or side assemblies.
4. Lay out arc and bandsaw to shape.
5. Notch on bandsaw for rear stringers.
6. Glue up frame using corner blocks on *all* corners.
7. Drill ⅜ in. holes 2 in. deep for dowels in all joints, glue, and install dowels.

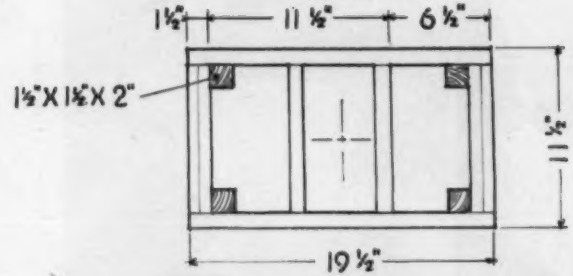
Rocker and Swivel Base

1. Bandsaw and shape rocker base (disk sander is best).
2. Swivel base: (*a*) square up all pieces, (*b*) glue up (with corner blocks), and (*c*) drill and dowel all joints.

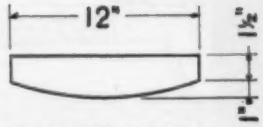
Legs

1. Square up.
2. Cut angles on legs and rails.
3. Taper legs (bandsaw and plane).
4. Cut halflaps on legs and on rails to match (use same setup for all cuts).
5. Cut half lap on rails.

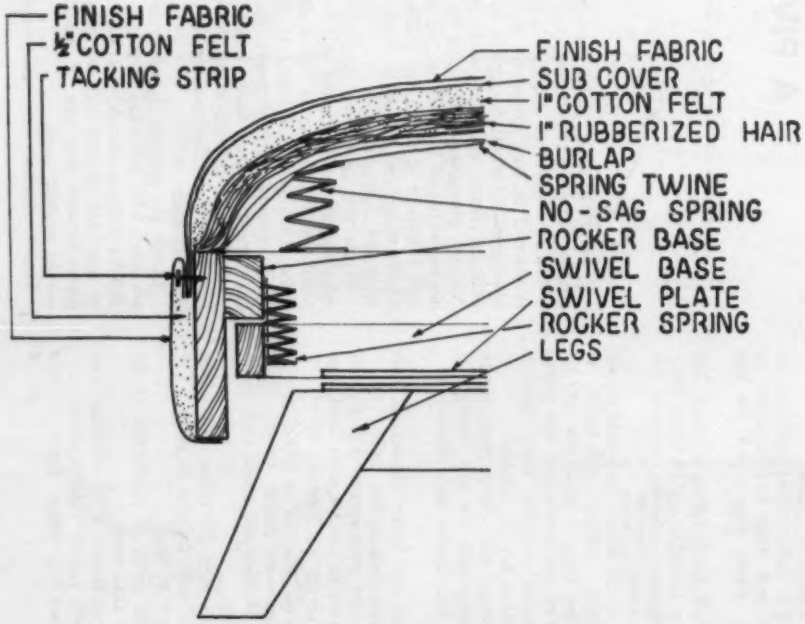




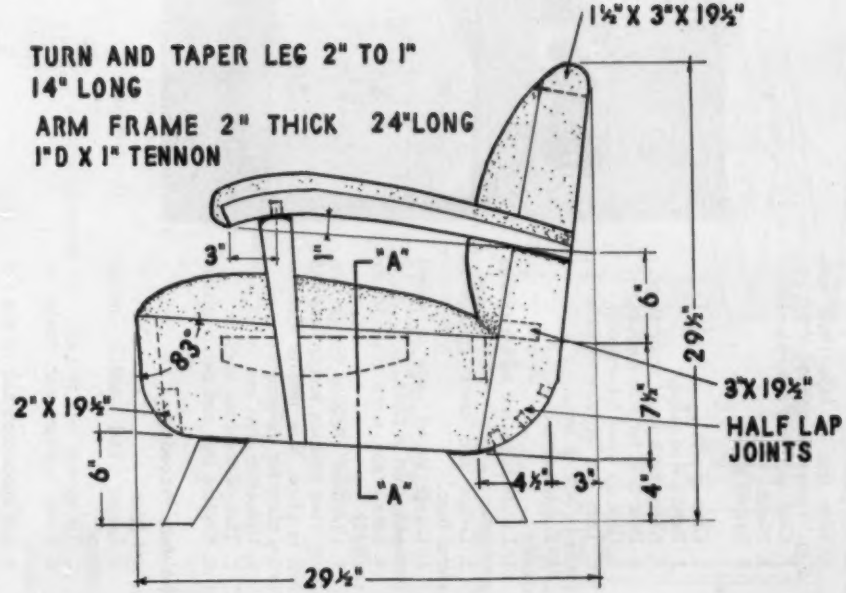
SWIVEL BASE
FLUSH ON TOP



ROCKER BASE



SECTION "A-A"



6. Glue legs to rails (bolt with ¼ in. carriage bolts when dry).
7. Glue and bolt rails together.
8. Finish.
9. Install glides.

Arms

1. Glue up arms.
2. Bandsaw to shape.
3. Notch back to fit chair shape.
4. Bore hole for arm support.
5. Glue up wood for support.
6. Turn arm support on lathe (fit tenon to hole in arm).
7. Finish support.

Assembly

1. Locate and screw rocker springs onto base.
2. Locate and screw springs to swivel base.
3. Locate swivel plate to swivel base and screw in place.
4. Locate and screw plate to leg assembly.
5. Upholster chair as far as subcover, then position rocker base and bolt in place. Now remove legs and swivel plate for convenience.
6. Upholster arms and install.
7. Tack or sew back in place.
8. Replace legs and swivel plate.

Upholstery Procedure

Seat and Back

1. Locate and install no-sag springs.
2. Tie springs with twine.
3. Cover springs with burlap or canvas.
4. Cut rubberized hair to size and locate with 5 or 6 tacks.
5. Cover with 1 in. cotton felt, locate with 5 or 6 tacks.
6. Tack light cotton subcover in place. Check shape and fit, adjust as needed (check section AA for lay-out).
7. Tack finish fabric in place (see step 5 in assembly before doing this). Use extreme care on corners for smoothness.
8. Cut and locate back side pieces.
9. Finish tacking and finish off with gimp nails or hand sew on top.
10. Cut and locate seat side pieces and install (overlap back pieces). See section AA for method.
11. Same with front piece, finish with gimp nails or sew (sewing is neater but harder and slower).

Arms

1. Cut and locate rubberized hair and locate with a few tacks.
2. Cover with cotton felt. *Do not cover area in contact with back*, also leave bottom uncovered.
3. Tack subcover in place.
4. Tack on finish fabric, wrap around bottom and finish tack on in side edge.
5. Cut hole in fabric for tenon and glue arm support in place.

Install Back of Back

1. Cut piece of cardboard ¼ in. smaller than back.
2. Cut fabric 3 in. oversize and place over board. Tape in place.
3. Tack in place (sew if you wish). ◀

— Masonite Corp.

A PIVOT TOP DESK

A pivot-top desk can be made by the student for his own or family use.

The moving top, capable of being positioned at any point of its circle, pivots on a concealed carriage bolt, its pedestal being equipped with casters. Normal stopping points are at right angles with and in front of the cabinet unit below, or at either end. Dimensions of the swivel top are 48 in. long, 22 in. wide and 27 in. high.

While the cabinet is conventionally constructed for the most part, it has some features that make the design unusual. One side is devoted to storage behind sliding pegboard doors, the other to storage in two drawers which are concealed by the adjoining perforated panel when the first-mentioned storage space is open.

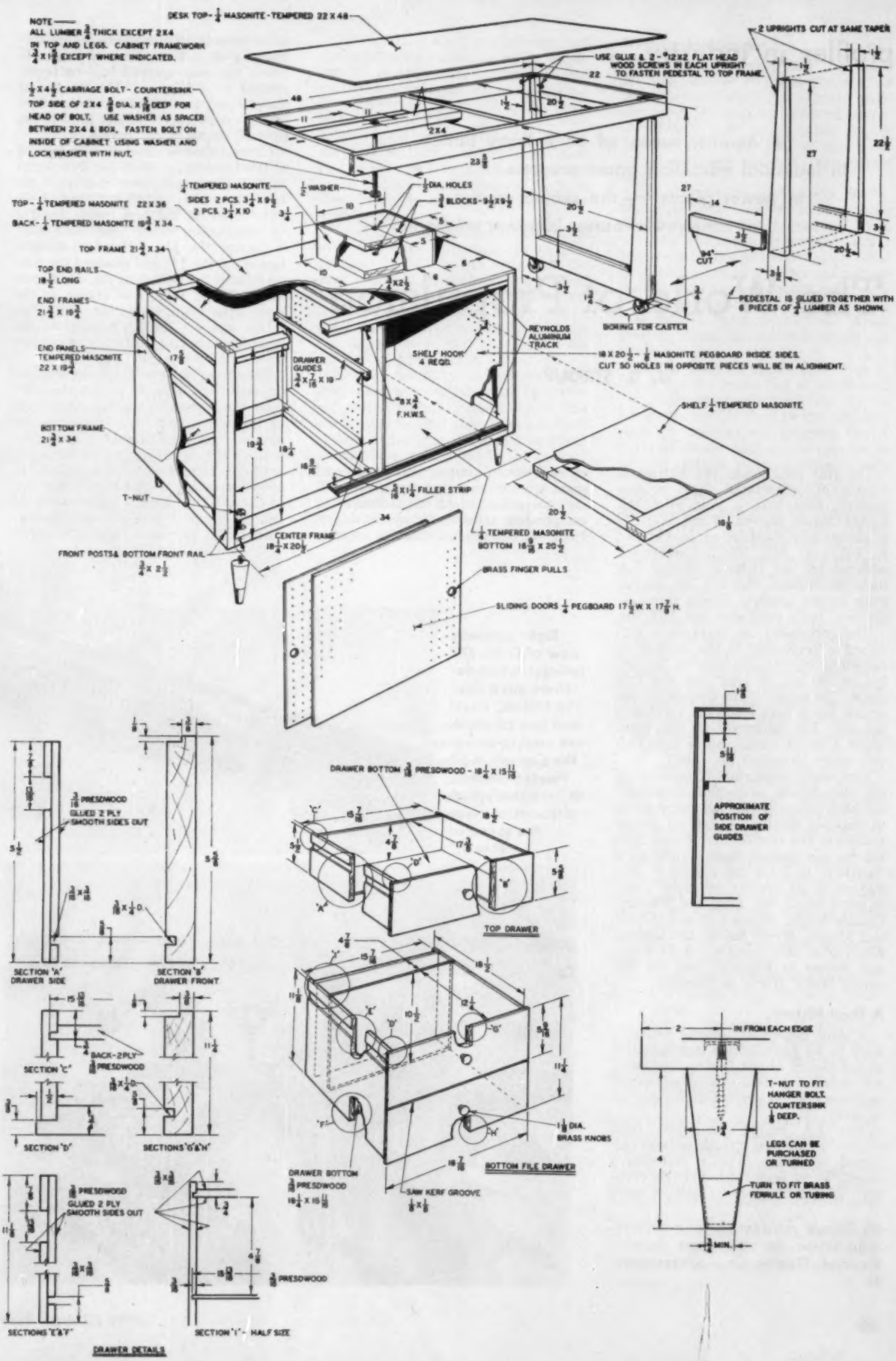
Inside the storage chamber the ends are lined with pegboard so that wooden shelves may be suspended at any height in intervals of one inch by means of metal fixtures that can be inserted or moved without tools.

Drawer construction, while unconventional, is economical in construction and efficient in operation, according to John Bergen, a furniture designer who created this desk design. Excepting for the fronts, which are lumber, both drawers are constructed of single thickness and double plies of Masonite 3/16 in. Tempered Presdwood, dovetailed and glued for unusually easy operation and long wear.

Framing of the cabinet is 1 by 2-in. lumber faced, bottomed and topped with ¼ in. Presdwood. The pegboard doors slide in aluminum tracks, available from lumber or hardware stores.

The housing for the carriage bolt swivel is 10 by 10 by 3¼ in. and is formed of a wood top and bottom and sides of ¼ in. Presdwood.

With the swivel top primed and painted a dark color, contrasting with the lighter color of the cabinet and the pedestal and the white of the drawer fronts and doors, the pivot top desk is an attractive as well as functional piece of furniture — ideal for the student's own room. ◀


NOTE— ALL LUMBER ¾ THICK EXCEPT 2X4 IN TOP AND LEGS. CABINET FRAMEWORK ¾ X 1⅝ EXCEPT WHERE INDICATED.
DESK TOP- ¼ MASONITE-TEMPERED 22 X 48
2 UPRIGHTS CUT AT SAME TAPER
USE GLUE & 2-#12X2 FLAT HEAD WOOD SCREWS IN EACH UPRIGHT TO FASTEN PEDESTAL TO TOP FRAME.
½ X 4½ CARRIAGE BOLT- COUNTERSINK TOP SIDE OF 2X4 ⅜ DIA. X ⅜ DEEP FOR HEAD OF BOLT. USE WASHER AS SPACER BETWEEN 2X4 & BOX. FASTEN BOLT ON INSIDE OF CABINET USING WASHER AND LOCK WASHER WITH NUT.
¼ TEMPERED MASONITE SIDES 2 PCS. 3¼ X 9½ 2 PCS. 3¼ X 10
½ WASHER
½ DIA. HOLES
¾ BLOCKS- 3½ X 9½
TOP- ¼ TEMPERED MASONITE 22 X 36
BACK- ¼ TEMPERED MASONITE 18¾ X 34
TOP FRAME 21¾ X 34
TOP END RAILS 18½ LONG
END FRAMES 21¾ X 19¾
END PANELS- TEMPERED MASONITE 22 X 19¾
DRAWER GUIDES ¾ X ⅞ X 19
SHELF HOOK 4 REQ'D.
REYNOLDS ALUMINUM TRACK
18 X 20½ - ⅛ MASONITE PEGBOARD INSIDE SIDES. CUT SO HOLES IN OPPOSITE PIECES WILL BE IN ALIGNMENT.
#8 X ¾ F.H.W.S.
SHELF ¼ TEMPERED MASONITE
BOTTOM FRAME 21¾ X 34
T-NUT
⅝ X 1¼ FILLER STRIP
CENTER FRAME 18¼ X 20½
FRONT POSTS & BOTTOM FRONT RAIL ¾ X 2½
¼ TEMPERED MASONITE BOTTOM 18⅝ X 20½
BRASS FINGER PULLS
SLIDING DOORS ¼ PEGBOARD 17½ W X 17⅞ H.
BORING FOR CASTER
PEDESTAL IS GLUED TOGETHER WITH 6 PIECES OF ¾ LUMBER AS SHOWN.
84° CUT
3/16 PRESDWOOD GLUED 2 PLY SMOOTH SIDES OUT
SECTION 'A' DRAWER SIDE
SECTION 'B' DRAWER FRONT
BACK- 2 PLY ⅛ PRESDWOOD
SECTION 'C'
SECTION 'D'
SECTIONS 'G' & 'H'
DRAWER BOTTOM ⅛ PRESDWOOD - 18¼ X 15 11/16
TOP DRAWER
BOTTOM FILE DRAWER
1⅛ DIA. BRASS KNOBS
DRAWER BOTTOM ⅛ PRESDWOOD 18¼ X 15 11/16
SAW KERF GROOVE ⅛ X ⅛
APPROXIMATE POSITION OF SIDE DRAWER GUIDES
2 IN FROM EACH EDGE
T-NUT TO FIT HANGER BOLT. COUNTERSINK ⅜ DEEP.
LEGS CAN BE PURCHASED OR TURNED
TURN TO FIT BRASS FERRULE OR TUBING
¾ MIN.
⅛ PRESDWOOD GLUED 2 PLY SMOOTH SIDES OUT
SECTIONS 'E' & 'F'
SECTION 'I' - HALF SIZE
DRAWER DETAILS

▶ Another survey of an industry basic to industrial education traces progress in power plants — the subject matter of tomorrow's courses in power mechanics —

The World of Propulsion

J. B. STROUP

The year 1962 marks the 20th anniversary of jet-powered flight in this country. Less than a year after the United States entered World War II, it successfully flight-tested on October 2, 1942, a Bell XP-59 Aerocomet powered by two General Electric I-A turbo-jet engines, the first jet engines made in this country. Engine thrust at sea-level static conditions was 1300 lbs.

The subsequent 20 years have witnessed a revolution in the method of propelling objects, not only in the air, but on the sea, on land, and now into space. The power of the propulsive machines, which have made this revolution possible, has advanced to the point where a rocket engine can be built that will create 20-million lbs. thrust.

Like many pioneering technologies of the past decade, propulsion technology has been stimulated by the urgent needs of national defense. A host of engine makers in this country and abroad have led the way through many technological "barriers" to bring the science of propulsion to its present advanced state: to name only a few, Pratt and Whitney, Curtiss-Wright, Allison Division of General Motors, Westinghouse, and General Electric in this country; Rolls-Royce and Bristol in England; and the Bavarian Motor Works in Germany.

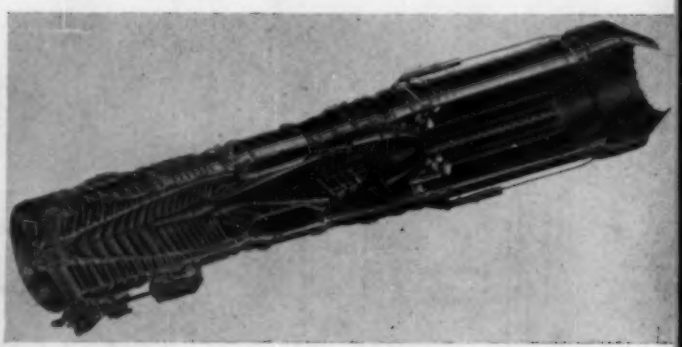
A Short History

A short history of General Electric's work in jet propulsion is representative of the history of the field — illustrating the technical problems faced and solved in the science — and, therefore, may be in order.

The I-A engine, developed from studies of the first British turbojet designed by Frank Whittle, initiated a family of jet engine types in this country: the centrifugal-flow engine. A series of engines, utilizing a centrifugal compressor, were developed during succeeding years. Each used the technique of compressing ambient air by moving it from the center of a spinning impeller to its outside circumference before discharging it into combustion chambers where fuel was sprayed into the compressed air and ignited. The velocity of the escaping gas turned a turbine wheel to drive the compressor and provide the forward thrust of the engine.

General Electric developed six engines of this basic design, each one a performance improvement over the last: the I-A, I-14, I-16, I-18, I-20 and I-40. (The I-16 was the first engine given a "J" designation by the Army Air Force; it became the J31.) The I-40 became famous as the J33 and powered the first operational jet fighter of the Air Force, the Lockheed P-80, now known as the F-80. The J33, producing 4000 lbs. thrust, was also the last member of the centrifugal compressor family of engines developed by General Electric.

Concurrently with the development of the centrifugal-flow jet engine, the company was pioneering another basic type of propulsive unit: the turboprop engine — a gas turbine geared to a propeller. The T31 engine, utilizing an axial-flow compressor, was first flown in 1945, producing 1900 hp. and 600 lbs. of thrust. This unusual combination of the conventional propeller and the gas turbine has, of course, been later devel-



Right: cutaway view of G-E's J79 turbojet, which delivers more than 15,000-lb. thrust and four of which are used to power the Convair B-58 Hustler (below), at "extremely high altitudes at twice the speed of sound."

Mr. Stroup provides defense business information for the news bureau, General Electric Co., Schenectady, N. Y.

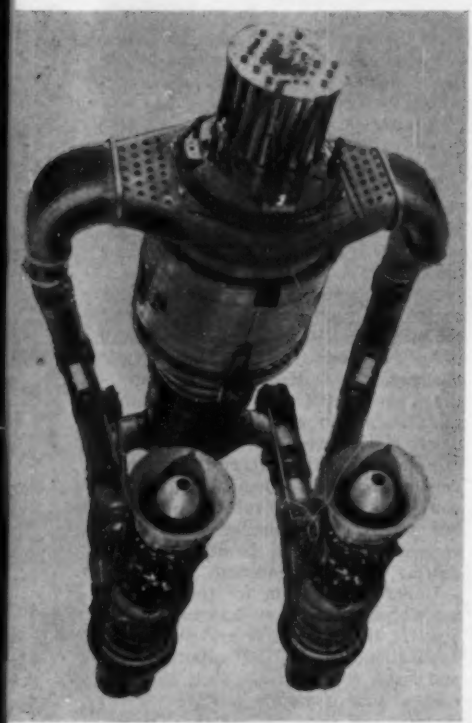
oped as a good propulsive system for low subsonic flight in both military and commercial aircraft.

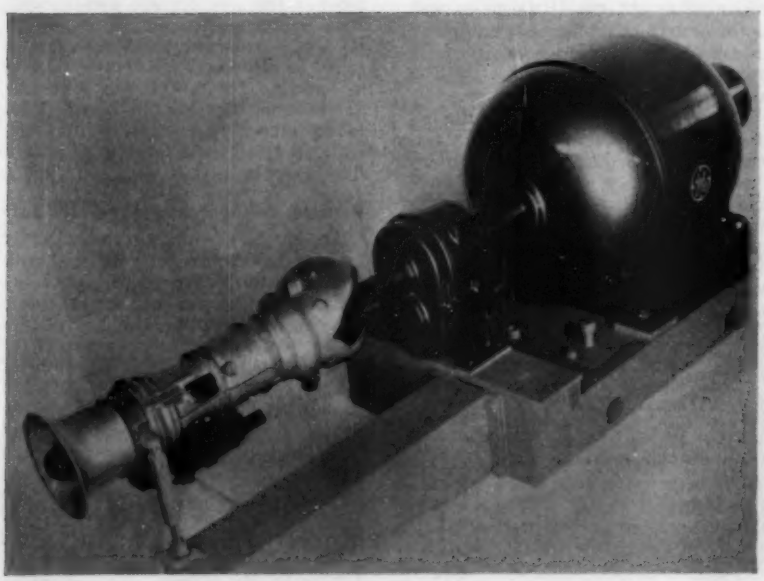
The axial-flow T31 engine demonstrated several new engineering ideas. It pointed out what many designers had theorized about — that an axial compressor can produce far higher pressure ratios than centrifugal compressors. By the addition of successive stages or rows of compressor blades along an axis, pressure could be built up far beyond the capabilities of the "I" family of engines.

The result of the T31 experience and advanced design thinking led to breaking the performance "barrier" the centrifugal-flow engine was approaching. New power and new efficiencies could be achieved and the "jet science" took a huge step forward. The J35 engine, the first axial-flow turbojet, was first run in 1944. A Boeing XB-47, powered by six J35's, moved across the U. S. in three hours, 46 minutes in 1949, a new world's record.

In 1948 an improved axial-flow engine with a 12-stage compressor began production, the J47. It was to become the most produced jet engine in the western world with more than 29,000 of them produced by G. E. alone by the end of the Korean War. It moved B-47 bombers at speeds of 600 mph and F-86 fighters up to 670 mph.

New technical improvements were discovered to boost J47 power by spraying water/alcohol mixtures into the combustion sections and attaching afterburners at the rear of the turbine wheel which added ignited fuel to the exhaust gas for greater power. A post-Korean War advancement over the J47 was made in the J73 engine, taking advantage of further knowledge and experience in turbojet technology.





Left: key components of HTRE-3, the aircraft nuclear powerplant which uses a nuclear reactor as a power plant for a turbojet engine. Below is a scale model of G-E's model 720 gas turbine-generator unit.

New Design Barrier

But designers recognized they were reaching another technical "barrier," a point beyond which jet aircraft could not move. Jet propulsion seemed limited to subsonic flight speeds unless greater power could be obtained at reasonable weight increases and fuel consumption rates.

The J73 engine, and others like it, are single rotor, fixed-stator compressor machines. The 7 to 1 compression ratio was near the operating limit of such a compressor. If a J73 compressor could be made to run at a higher compressor ratio, say 12 to 1, it would greatly increase compressor efficiency, reduce fuel consumption, and create the much greater power needed for supersonic speeds.

But at pressure ratios over 7 to 1, the J73 and engines like it would stall "at off-design conditions," that is, at low engine speeds short of the performance the machine was designed for. A J73 compressor designed to operate at 12 to 1 pressure ratios at design speeds would stall at lower speeds. The larger blades of the initial stages of the compressor would push more air back to the smaller rear blades than they could handle. The air which could not pass through the compressor would recirculate, and the compressor would "choke" on its own food.

Engine designers knew that the higher the rate at which the engine compressor can pack in the air, the lower the fuel consumption and, therefore, one means to improve engine efficiency. And they knew that to a great extent, the higher this pressure ratio, the greater the power of the engine. The "stall" problem had to be licked or abandon jet propulsion for advanced aircraft.

All major engine designers were facing the "barrier," and General Electric, Pratt & Whitney, and Rolls-Royce moved to solve it. Their solutions have determined the future of large turbojet machinery.

Some means of regulating airflow to the rear stages of the compressor when the engine was running at lower rpms had to be found while allowing maximum flow at peak engine speeds. Engine designers came up with three practical ways to accomplish this:

1. Dump the excess air overboard by way of interstage bleed valves, or "pop-off" valves.
2. Reduce the airflow through the front stages by using two rotors moving at different rpms, thus creating a low and high pressure rotor — the "twin-rotor" technique.
3. Reduce the airflow through the front stages at off-design points by using variable stators in these stages, which limit the movement of the air.

Each of these techniques accomplishes the objectives of regulating airflow through the compressor in order to gain high compression ratios with greater thrust at reduced fuel consumptions. But each does not have the same mechanical, operational, and structural advantages.

"Pop-off" valves, or interstage bleed, can waste power in these thrust classes and are mechanically complex at a 12 to 1 compression ratio. Smaller engines, such as G-E's J85, use the technique quite efficiently. General Electric set up competitive task force study teams to see whether the variable stator method or the twin-rotor method would be preferable. Variable stators, an old technique used originally in the company's steam turbines in the 19th century, won. The deciding factors were variable stator simplicity, reliability, weight, ease of maintenance, and costs. The twin-rotor technique was found to be heavier, more complex with its necessary use of concentric shafts with multiple bearings, and more difficult to match and maintain the same performance parameters.

General Electric in its jet engine plant near Cincinnati, Ohio, constructed a high pressure ratio research compressor and ran it under a variety of conditions. Seventeen stages were made variable. After extensive experimentation and study, varying only a few stages at a time, designers optimized on six variable stages plus the inlet guide vanes. Their final creation was the first supersonic turbojet, the J79 engine. Performance: more than 15,000 lb. thrust for 3800 lb. weight. It delivers more thrust per lb. of engine weight than any other production engine in its class. Four J79's move the Convair B-58 bomber at speeds of more than 1400 mph. This is the airplane which recently claimed six new world's speed records for the Air Force. The J79-powered Lockheed F-104 won the 1958 Collier Trophy, aviation's most coveted award, and holds the world's altitude record of 103,395 feet.

Perhaps the ultimate in turbojet technology is now under development at G. E.'s Cincinnati jet engine plant. The J93 turbojet is designed to power the Air Force's B-70 heavy bomber at speeds three times that of sound.

The New Family

With the solution of this and other basic power/efficiency problems has come a new world of propulsion devices in the last five years. Research and development knowledge has been widely applied to a whole spectrum of propulsive systems, now ranging from multi-million lb. thrust rocket engines to an ion engine under development that will produce a few ounces of thrust for moving satellites about in space. Propulsive systems are now powering helicopters (called "turbocopters"), hydrofoil boats, vertical takeoff aircraft, commercial jetliners, nuclear submarines, missiles and satellites, and may soon power manned space ships.

The method of propulsion for these applications all stem from the "old-hat" idea of compressing something, heating it, and exhausting it to obtain power of movement.

Commercial Jet Transports

Take the commercial transport powerplant, for example. Although reliable, low cost turbojet engines were available as early as 1946 in the United States, they were considered impractical for commercial transport application for three compelling reasons: fuel consumption, thrust, and weight.

Not until the specific fuel consumption of the engine was reduced at high cruising speeds at high altitudes did the powerplant become practical. This improvement in aircraft turbojet efficiency was achieved through the development of high compressor pressure ratios, high component efficiencies, and materials to withstand high turbine inlet temperatures. It has resulted in the present generation of long and medium range commercial transports in this country such as the Boeing 707, Douglas DC-8 and the Convair 880. The General Electric CJ-805-3 turbojet, a commercial derivative of the military J79, powers the Convair 880 transport at the highest subsonic speeds of any in-service transport (maximum speeds reach 615 mph at 35,000 feet).

But the commercial turbojet can do better than the first generation indicates. Engine designers realized that, when the straight turbojet engine reached the pressure ratios and efficiencies offered in today's commercial engines, further decreases in fuel consumption would be very difficult to obtain. The machine was near its optimum. It was also widely recognized that a commercial turbojet must have high takeoff thrust together with a level of cruise thrust giving speeds in the range of a little less than the speed of sound. The straight turbojet does not fit these thrust characteristics particularly well. An engine designed for the necessary takeoff thrust will be overpowered at cruise. The engine designed for necessary cruise power will require some form of takeoff thrust augmentation.

It was clear that some improvement must be made to the basic turbojet cycle. G-E studies indicated that the optimum combination of specific fuel consumption and specific weight, as well as the desired match between cruise and takeoff thrusts, could be achieved by using the "by-pass" principle with a high pressure ratio gas generator.

Two design courses to realize the by-pass principle were well known: a forward fan attached and actually forming the front portion of the compressor; and an independent aft fan obtaining its energy from a separate free floating turbine. The company investigated both designs, eventually dropping the multi-stage front-fan design after substantial testing.

The resulting turbofan engine, the CJ-805-23, powers the Convair 990 transport. The results: 40 per cent improvement in takeoff thrust; 20 to 40 per cent improvement in climb thrust; 12 to 18 per cent improvement in cruise thrust; no increase in fuel flow; and the added benefit of an overall noise reduction in engine operation. The same basic design principle has been applied to a smaller turbofan, the CF700, an aft-fan engine for light and medium weight aircraft. It utilizes the gas generator of the small G-E turbojet, the J85.

The Turbocopter

Let us take the gas generator of such turbojets, add a free-power turbine and its shaft, and we have a turboshaft engine for helicopters and other rotary powered craft. G-E's T58 turboshaft engine, designed as a lightweight powerplant for military as well as commercial helicopters or "turbocopters," develops more power per pound of engine weight than any other turboshaft flying today. Less than five ft. long and only 16 in. in diameter, the engine weighs 285 lb., yet produces 1250 hp.

The commercial counterpart of this engine, the CT58, is slated to power new "turbocopter" fleets ordered by all three of the nation's major helicopter airlines — New York Airways, Chicago Helicopter Airways and Los Angeles Airways. It is already in operation in Los Angeles.

The T58 engine takes advantage of General Electric's previous experience with aircraft turbine engines, starting with the T31. It uses the variable stator principle in its 10-stage, axial-flow compressor; it uses the horizontally split combustor casings and conical turbine shaft of the J79 turbojet.

An even more advanced turboshaft machine is now under development — the T64. It is a multi-purpose turboshaft/turboprop engine, a 2600 horsepower class powerplant, and is designed in four configurations: two turboshaft versions, one with reduction gearing and one without; and two turboprop models, one with the propeller gear above the engine centerline and the other with the gearing below the centerline.

Under development for the Navy as a powerplant for heavy-duty and tactical aircraft, the T64 has several and varied application possibilities in both rotary and fixed wing aircraft such as flying cranes, anti-submarine warfare (ASW) aircraft, and large helicopters. The engine's ability to operate continuously from 45 deg. below the horizontal to 100 deg. above also makes it especially suited to tilt-wing VTOL (vertical takeoff and land) aircraft. It will power the de Havilland Caribou, an Army STOL (short takeoff and land) logistics aircraft, in a flight test program scheduled for the spring of this year.

Vertical Takeoff and Land Aircraft

Another branch of the turbojet family are the powerplants for vertical takeoff and land aircraft now under active development. The J85 engine, the basic gas generator for the CF700 turbofan engine and a prime powerplant for NASA's Bell X-14, the Air Force's GAM-72 decoy missile, the T38 jet trainer and the N-156F supersonic fighter, has been coupled to a "lift-fan" device that will power a new generation of VTOL aircraft. By diverting the turbojet's exhaust to small turbine buckets on the outer circumference of a large single-stage compressor wheel,

(Concluded on page 52)

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ACIATE PREVIEW

(Continued from page 23)

SECTION 2: *Instruction in Industrial Arts Education.*

Section Leader: Gardner Boyd, Director of Industrial Arts, Kansas City, Mo.

Resource Person: James C. O'Gara, Supervisor of Industrial Arts Education, Portland, Ore.

Recorder: Robert W. Utke, Everett High School, Lansing, Michigan

Host: John Tammeryn, Director of Industrial Arts Education, Hillsborough County, Fla.

SECTION 3: *Facilities for Industrial Arts Education*

Section Leader: James O. Gillilan, Supervisor of Industrial Arts Education, St. Louis, Mo.

Resource Person: Kenneth L. Schank, Consultant in Practical Arts, Racine, Wis.

Recorder: Andrew W. Ault, Supervisor of Industrial Arts Student Teachers, Morgantown, W. Va.

Host: Stanley E. Sweet, Supervisor of Industrial Arts Education, Clearwater County, Fla.

SECTION 4: *Teachers of Industrial Arts Education*

Section Leader: G. Wesley Ketcham, Consultant in Industrial Arts Education, Connecticut State Department of Education, Hartford

Resource Person: William H. Payne, Jr., Supervising Director of Industrial Arts Education, District Schools, Washington, D. C.

Recorder: William F. Bowin, Supervisor of Mathematics and Industrial Arts Education, Syracuse, N. Y.

Host: William J. Dunlop, Industrial Arts Consultant, Spokane, Wash.

WEDNESDAY, APRIL 5
11:00 a.m. to 12:00 noon

Topic: Business Meeting and Installation of Officers

Chairman: Robert L. Woodward

American Council on Industrial Arts Teacher Education

TUESDAY, APRIL 4, 1961
9:00–11:30 a.m.

Opening Remarks: Paul T. Hiser, Program Chairman, A.C.I.A.T.E.

Chairman: C. Robert Hutchcroft, University of Michigan, Ann Arbor

Welcome: Philip J. Hickey, Superintendent of Instruction, St. Louis, Mo.

Recorder: Frederick D. Kagy, Colorado State College, Greeley

Host: Charles W. Phallen, State University of New York, College of Education, Oswego

TOPIC *1.* Technology: Present and Future

Speaker: Robert D. Helsby, Executive Deputy Industrial Commissioner, New York State Department of Labor, Albany

TOPIC *2.* Technology and Its Impact Upon People

Speaker: Richard R. Crow, Director of Personnel Administration, The Stouffer Corporation, Cleveland, Ohio

TOPIC *3.* Implications of Technological Advance for Industrial Arts Teacher Education

Speaker: R. Lee Hornbake, Vice-President for Academic Affairs, University of Maryland, College Park

TUESDAY, APRIL 4, 1961
1:30–3:30 p.m.

Chairman: Ralph O. Gallington, Southern Illinois University, Carbondale

Recorder: Paul W. DeVore, State University of New York, College of Education, Oswego

Host: Donald R. Tolbert, Lincoln University, Jefferson City, Mo.

TOPIC *4.* Competencies Needing Greater Emphasis in Pre-service Education of Industrial Arts Teachers To Meet the Technological Advance and Cultural Changes

SUB-TOPIC *1.* In the General Education Area

Speaker: John R. Ludington, Director, Aid to State and Local Schools Branch, U. S. Office of Education, Washington, D. C.

SUB-TOPIC *2.* In the Technical Area

Speaker: Delmar W. Olson, Kent

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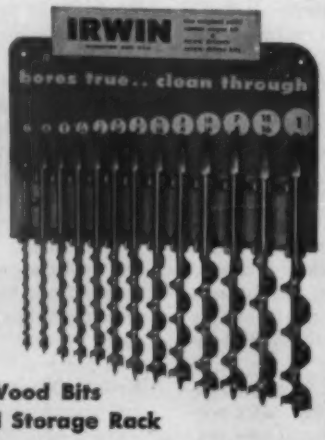

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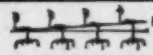

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SUB-TOPIC *3.* In the Professional Area

Speaker: William J. Micheels, University of Minnesota, Minneapolis

TOPIC *5.* What Do Needed Competencies of Industrial Arts Teachers Imply for College Admission and Selection Practices?

Speaker: Kermit A. Seefeld, University of California, Santa Barbara

TUESDAY, APRIL 4, 1961
7:30–9:00 p.m.

Theme: Research Approaches and Problems That Challenge the Profession

Chairman: Willis E. Ray, The Ohio State University, Columbus

Recorder: Lee Smalley, State University of New York, College of Education, Buffalo

Host: Wilbur J. Farr, Long Beach State College, Long Beach, Calif.

TOPIC *6.* Program Research: A Report of One Contribution

Speaker: Jerome Moss, Purdue University, West Lafayette, Ind.

TOPIC *7.* Teaching Machines: A Review of Research with Implications for Industrial Arts Education

Speaker: Charles B. Porter, University of Illinois, Urbana

TOPIC *8.* Needed Research: Proposals by the AIAA Research Committee

Speaker: Robert M. Worthington, Trenton State College, Trenton, N. J.

WEDNESDAY, APRIL 5, 1961
7:30–9:15 a.m. Breakfast

Annual Yearbook Presentation

Chairman: Donald R. Maley, University of Maryland, College Park

Presentation of Yearbook X: William McKnight, Jr., and Wesley Stephens, McKnight and McKnight Publishing Company, Bloomington, Ill.

Acceptance of Yearbook: Ralph C. Bohn and Ralph Norman, Editors, San Jose State College, San Jose, Calif.

Presentation of the Man-of-the-Year in Teacher Education

Awards of Honorary Membership

WEDNESDAY, APRIL 5, 1961
9:30–11:00 a.m.

Joint Meeting of the American Council on Industrial Arts Teacher Education and American Council of Industrial Arts Supervisors

Chairman: Edwin L. Kurth, Department of Education, State of Florida, Tallahassee

Recorder: Lowell Carver, Iowa State University, Ames

Host: Burton Chase, South West High School, St. Louis, Mo.

TOPIC *9.* Off-Campus In-Service Programs and Supervision

Speaker: David O. Taxis, Consultant in Industrial Arts Education, Los Angeles County, Calif.

TOPIC *10.* A Report and Evaluation of an In-Service Program for Industrial Arts Teachers

Speaker: John R. Lindbeck, Western Michigan University, Kalamazoo

Panel Discussion: Reactions from Teachers on Pre-service and In-service Needs of Industrial Arts Teachers

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AIAA PREVIEW

(Continued from page 23)

THURSDAY, APRIL 6, 1961
2:30–4:00 p.m.

PANEL DISCUSSION NO. 3: "Should Teaching Methods for Industrial Arts Change?"

Discussion Group Chairman: Eckhart A. Jacobsen, Associate Professor, Industrial Education, University of Maryland, College Park, Md.

Host: Victor Gagaini, Hazelwood Senior High School, St. Louis, Mo.

Recorder: Raymond VanTassel, Professor and Chairman, Department of Vocational Education, School of Education, New York University, N. Y.

Speakers:

Arthur W. Earl, Professor, Industrial Arts Education, Montclair State College, Upper Montclair, N. J.

Everett R. Glazener, Division of the Arts, Colorado State College, Greeley, Colo.

Lee H. Smalley, Assistant Professor, Industrial Arts Division, State University of New York, College For Teachers, Buffalo, N. Y.

THURSDAY, APRIL 6, 1961
2:30–4:00 p.m.

PANEL DISCUSSION NO. 4: "Should the Nature of Manipulative Work in Industrial Arts Change?"

Discussion Group Chairman: H. B. Olstad, Head of Industrial Arts, Manitowoc, Wis.

Host: Donald Wintermute, Lindberg School District, St. Louis, Mo.

Recorder: Chester R. Brown, Associate Professor, Industrial Arts Education, University of New Mexico, Albuquerque, N. Mex.

Speakers:

Cary L. Hill, Head, Department of Industrial Arts Education, Oklahoma State University, Stillwater, Okla.

George R. Keane, Associate Professor, City College of New York, New York City, N. Y.

THURSDAY, APRIL 6, 1961
2:30–4:00 p.m.

PANEL DISCUSSION NO. 5: "Should the Physical Facilities for Industrial Arts Change?"

Discussion Group Chairman: Fred B. Robson, Dean, Industrial Arts Education, Oklahoma City University, Oklahoma City, Okla.

Host: Delmar Loveall, McCluer Junior High School, St. Louis, Mo.

Recorder: Irvin Lathrop, Assistant Professor, Industrial Arts, Long Beach State College, Long Beach, Calif.

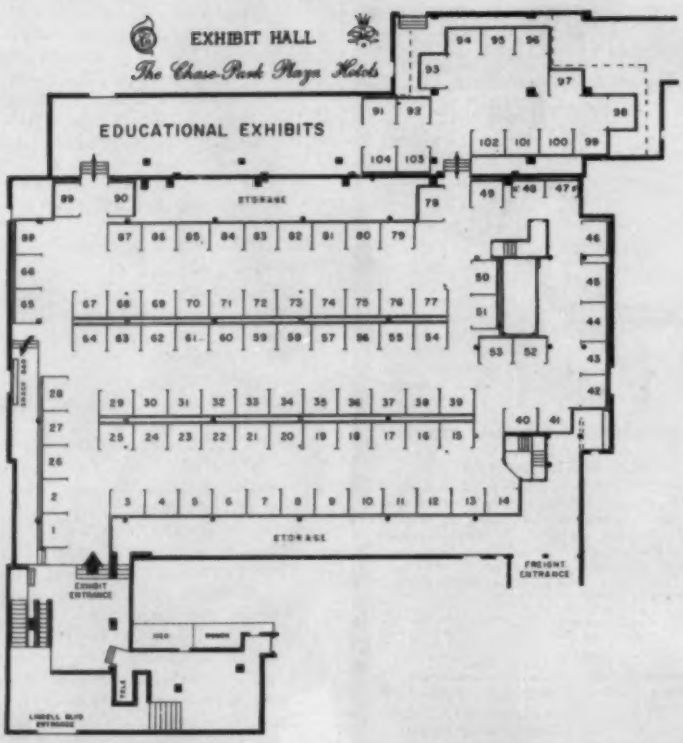
Speakers:

John H. Erickson, Vice-Chairman of Industrial Education, Southern Illinois University, Carbondale, Ill.

William T. Kelly, Assistant Director of Vocational and Industrial Arts Education, School District of Philadelphia, Philadelphia, Pa.

Frank A. Marschik, Associate Professor of Industrial Arts, Department of Industrial Arts, Kent State University, Kent, Ohio

William J. Wilkinson, Director, Industrial Arts Department, Nether Providence School District, Wallingford, Pa.



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THURSDAY, APRIL 6, 1961
7:30–9:00 p.m.

Topic: "What are the Bases for Organizing the Content of Industrial Arts?"

Program Chairman: Stanley E. Sweet, County Director, Industrial Arts Education, Clearwater, Fla.

Hosts: Carroll Eggemeyer, Mehlville Senior High School, St. Louis, Mo.; Warren Work, Hadley Technical High School, Hadley, Mo.

Recorder: Charles H. Sechrest, Associate Professor, College of Education, Wayne State University, Detroit, Mich.

Speakers:

Ralph Gallington, Chairman, Industrial Education, Southern Illinois University, Carbondale, Ill.

Lyman Goldsmith, Supervisor in Charge, Vocational and Practical Arts Section, Los Angeles Public Schools, Los Angeles, Calif.

Donald R. Maley, Professor and Chairman, Industrial Education, University of Maryland, College Park, Md.

Delmar W. Olson, Professor of Industrial Education, Kent State University, Kent, Ohio

FRIDAY, APRIL 7, 1961
9:00–11:00 a.m.

Topic: "What are some Illustrations of Industrial Arts Content that Reflect Advanced Technology? — Demonstrations"

Chairman: Ralph Gallington, Professor and Chairman, Industrial Education, Southern Illinois University, Carbondale, Ill.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC *1.* "What Characterizes Contemporary Industrial Arts in Grades K–6?"
Chairman: Robert G. Thrower, Ohio State University, Columbus, Ohio
Hosts: John Shemick, Department of Industrial Education, Pennsylvania State University, University Park, Pa.; Marion Freeman, Clayton High School, St. Louis, Mo.
Recorder: Elizabeth Hunt, State University of New York, College of Education, Oswego, N. Y.
Speaker: Robert J. Babcock, State University of New York, College of Education, Oswego, N. Y.
Group Discussion.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC *2.* "What Characterizes Contemporary Industrial Arts Drafting?"
Chairman: John R. Lindbeck, Associate Professor, Industrial Education Department, Western Michigan University, Kalamazoo, Mich.
Hosts: Irl Lake, Roosevelt High School, St. Louis, Mo.; Donald Hobbs, Berkeley Junior High School, St. Louis, Mo.
Recorder: Lawrence S. Wright, Associate Professor of Industrial Arts, Iowa State Teachers College, Cedar Falls, Iowa
Speakers:
John D. Rowlett, Associate Professor of Industrial Arts, Eastern Kentucky State College, Richmond, Ky.
Eugene M. Schanbacher, University High School, University City, Mo.
William P. Spence, Associate Professor, Industrial Education, Western Michigan University, Kalamazoo, Mich.

FRIDAY. APRIL 7, 1961
1:30–4:00 p.m.

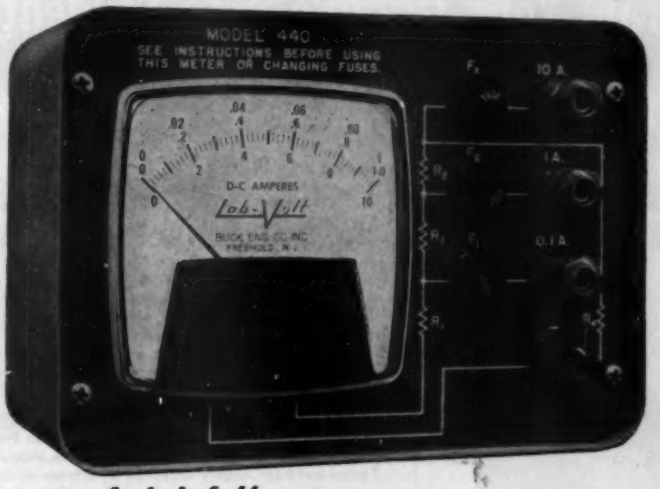
TOPIC *3.* "What Characterizes Contemporary Industrial Arts Electricity and Electronics?"
Chairman: Charles B. Porter, Associate Professor of Industrial Education, University of Illinois, Urbana, Ill.
Hosts: Gerald Impey, Ferguson High School, St. Louis, Missouri; Richard Blight, Shephard Elementary School, St. Louis, Mo.
Recorder: Talmadge Young, Associate Professor of Industrial Arts, North Carolina State College, Raleigh, N. C.
Speakers:
Arthur W. Bentz, Chairman, Industrial Arts Department, Freehold Regional High School, Freehold, N. J.
George J. Brown, Associate Professor of Industrial Education, Southwest Missouri State College, Springfield, Mo.
Joseph J. Sayovitz, Chairman, Industrial Arts Department, University of California — Santa Barbara, Goleta, Calif.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC *4.* "What Characterizes Contemporary Industrial Arts Graphic Arts?"
Chairman: Raymond L. Cornwell, Coordinator of Graphic Arts, State University, College of Education, Oswego, N. Y.
Host: George E. Kukal, Fairview High School, St. Louis, Mo.
Recorder: Francis D. Modlin, Associate Professor, Department of Printing and Photography, Industrial Education, Southern Illinois University, Carbondale, Ill.
Speakers:
Darvey E. Carlsen, Associate Professor, Industrial Arts Department, University of California, Santa Barbara, Goleta, Calif.
Otis H. Chidester, Director of Graphic Arts Department, Tucson High School, Tucson, Ariz.
Frederick D. Kagy, Professor of Industrial Arts, Colorado State College, Greeley, Colo.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC *5.* "What Characterizes Contemporary Industrial Arts Metalworking?"
Chairman: Jerry C. McCain, Associate Professor, Industrial Arts Department, North Texas State College, Denton, Tex.
Hosts: Claude Thomson, Mehlville Senior High School, St. Louis, Mo.; Arthur Kreyling, Bryan Hill Elementary School, St. Louis, Mo.
Recorder: Oran J. House, Instructor of Industrial Arts, Southern State Teachers College, Springfield, S. Dak.
Speakers:
R. E. Buxton, Professor of Industrial Arts, East Tennessee State College, Johnson City, Tenn.



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Menno Stucky, Assistant Professor of Industrial Arts, Bethel College, North Newton, Kans.
Theodore E. Wiehe, Associate Professor of Industrial Education, Stout State College, Menomonie, Wis.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC 6. "What Characterizes Contemporary Industrial Arts Plastics?"
Chairman: Henry A. Loats, Professor of Industrial Arts, Ball State Teachers College, Muncie, Ind.
Hosts: John Doing, Parkway Junior-Senior High School, St. Louis, Mo.; Edward Roberts, Ames Elementary School, St. Louis, Mo.
Speakers:
Peter Jackson, Instructor, Industrial Arts, Northwest Missouri State College, Maryville, Mo.
Neil L. Munson, Assistant Professor, Industrial Arts, Teachers College, Universtiy of Nebraska, Lincoln.
William E. Raborn, Industrial Arts, Snyder High School, Snyder, Tex.
Gerald L. Steele, Chairman, Industrial Arts, Orno Public Schools, Long Lake, Minn.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC 7. "What Characterizes Contemporary Industrial Arts Power and Auto Mechanics?"
Chairman: Robert D. Meran, Associate Professor, Industrial Arts Education, Chico State College, Chico, Calif.
Hosts: Marion Kribben, Maryland Heights High School, St. Louis, Mo.; Thomas Channey, North Kirkwood Junior High School, St. Louis, Mo.
Recorder: Edward C. Hein, Instructor, Industrial Arts Department, Colorado State University, Fort Collins, Colo.
Speakers:
Charles G. Risher, Assistant Professor of Industrial Education, Western Michigan University, Kalamazoo, Mich.
William G. Turner, Instructor, Industrial Education, Indiana State Teachers College, Terre Haute, Ind.
A. C. Vasis, Assistant Professor of Industrial Arts Education, Sabin Campus, Chicago Teachers College, Chicago, Ill.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC 8. "What Characterizes Contemporary Industrial Arts Woodworking?"
Chairman: Elmer J. Hemberger, Head, Industrial Arts Department, Downingtown Joint School System, Downingtown, Pa.
Host: Otis Eaton, Southwest High School, St. Louis, Mo.
Recorder: Robert G. Hammond, Associate Professor of Industrial Education, Northwestern State College, Natchitoches, La.
Speakers:
Billy W. Mayes, Sr., Vice-President of Texas Industrial Arts Association, Crane, Tex.
Homer E. Money, Associate Professor of Industrial Arts, North Texas State College, Denton, Tex.
David A. Rigsby, Assistant Professor of Industrial Arts, School of Education, Womans College, UNC, Greensboro, N. C.

FRIDAY, APRIL 7, 1961
1:30–4:00 p.m.

TOPIC 9. "Industrial Arts for Blind Students"
Chairman: John M. Hurley, Co-ordinator of Industrial Arts, City of New York Public Schools
Hosts: Charles Oellermann, Wellston Senior High School, St. Louis, Mo.; Booker T. Memmie, Vashon High School, St. Louis, Mo.
Recorder: Michael Meehan, Missouri School for the Blind, St. Louis, Mo.

FRIDAY, APRIL 7, 1961
6:30–8:30 p.m.

Annual Banquet:
Toastmaster: Ivan Hostetler, President of American Industrial Arts Association
Hosts: Allen Goodridge, Hazelwood Senior High School, St. Louis, Mo.; Pete Mercurio, Cleveland High School, St. Louis, Mo.
Speaker: M. Ray Karnes, Past President of the American Industrial Arts Association
TOPIC. "In View of Continuing Advances in Technology, What is the Future for Industrial Arts?"

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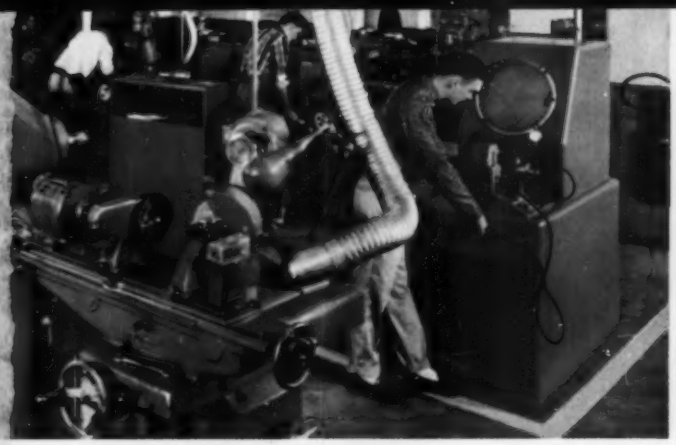
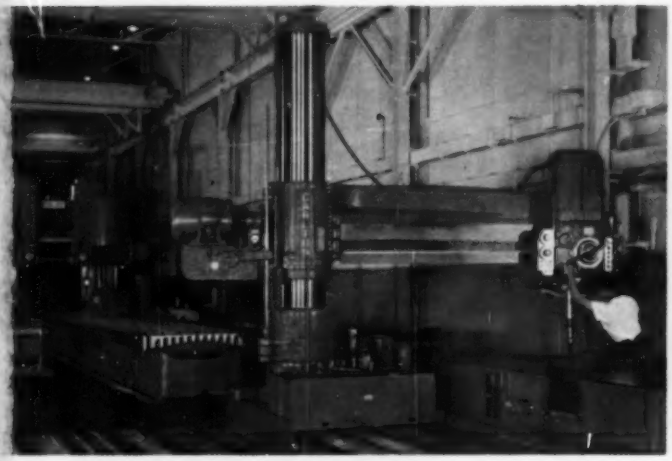


Note how yellow is used to indicate clearly machine controls and aisles in this shop of Morgood Tools, Inc., Rochester, N. Y. Non-critical areas of machines are painted a contrasting green.

In this photo, taken at the Cyril Bath Company, Solon, Ohio, the "warning color," orange, is used on moving objects in work areas. Yellow is again used on aisles, and moving overhead objects.



Here is another example of the way machine operating controls are painted in focal colors which contrast with the non-critical areas of the machine. Photo taken at Buhr Machine Tool Co., Ann Arbor, Mich.

Note the overhead crane, painted bright yellow in this installation at Davis Tool & Engineering Company, Detroit, Mich. This high-visibility color clearly shows moving overhead objects, promotes safety.

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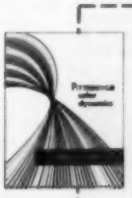

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FUTURE OF VOC-ED

(Concluded from page 16)

Pilot Programs and Research

There is a great need for the establishment of a number of pilot programs to determine the potential effectiveness of vocational education for certain groups. The need for vocational education and work experience for those who drop out of school, and the need for programs for the aging and other special groups, require the establishment of pilot programs.

After such pilot programs are operated for a period of time conferences should be held to consider accomplishments and to develop plans for the further extension of such programs. Pilot programs would be used to demonstrate the effectiveness and applicability of particular programs. There is likewise a need for the further development of research and experimentation in vocational education.

Guidance and Placement

An important factor in making vocational education effective is Guidance. In 1959, there were 13,369 full-time guidance counselors in public high schools. During that year, there were thousands of high schools without any professional guidance service. Many young people and adults have limited information about the thousands of occupations where people are employed. They are also in need of information concerning the occupational demands, where training may be received, the supply and demand for workers, salary and other benefits.

There is a need for the further development of placement services. Individuals who receive training in one area of the nation should be assisted in becoming placed regardless of the State or area where jobs are available. The closest possible liaison should be maintained between teachers, counselors, and placement personnel, and with agencies and organizations that are in a position to assist in the task of placing persons in jobs for which they were trained.

Legislation

National legislation for vocational education needs to be reviewed and modified where appropriate. The current vocational acts that have stimulated the federal-state co-operative education programs may need to be simplified and consolidated into one basic act. Such legislation should provide for necessary flexibility for the conduct of vocational education programs and make possible the modification and extension of these programs so the needs of youth and adults for vocational training may be provided during the years ahead.

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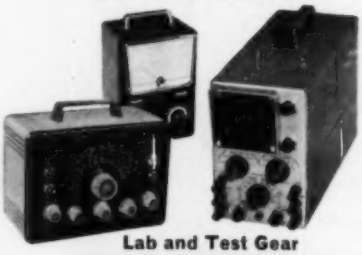

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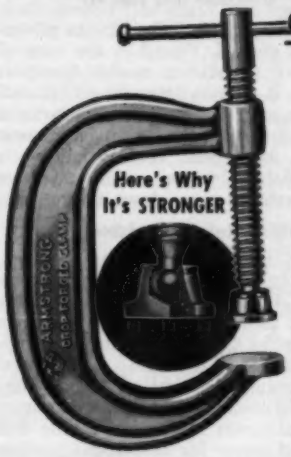

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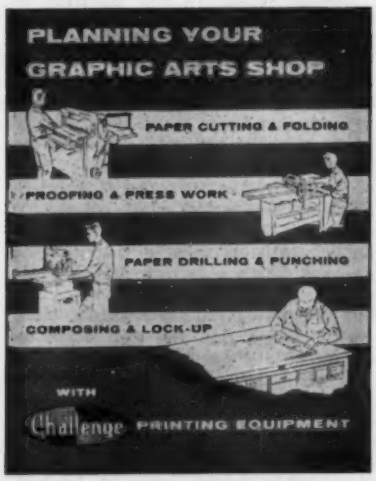

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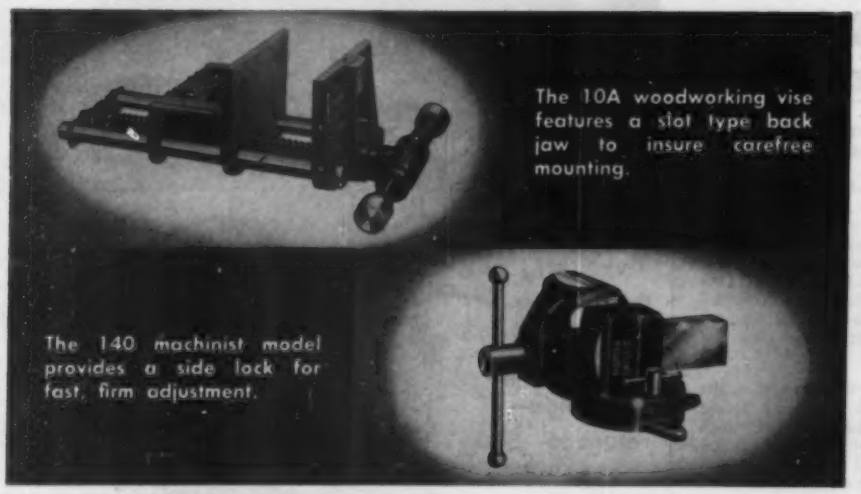
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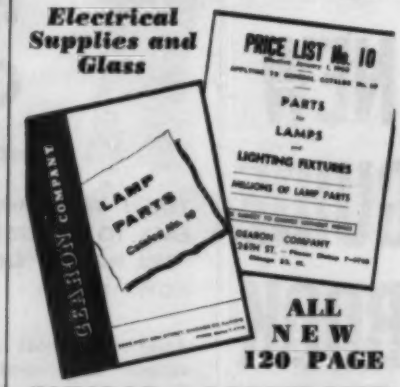

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WORLD OF PROPULSION

(Concluded from page 44)

called the "lift-fan," the lift-fan powerplant is created. Placed in the wing of an Army or Marine assault transport aircraft, it permits "straight up" takeoff from an aircraft carrier, and conversion to pure jet propulsion for the supersonic trip to the target. Vertical landing is accomplished by the simple diversion of jet exhaust gases from the engines.

The Turbine Returns to Land

The turbojet and turboshaft engines, invariably airborne powerplants, are returning to land now. New and highly efficient uses are being found for them in industrial applications, such as pumping units in oil-well fracturing operations, mobile electrical generating units providing emergency or peak load power, electrical power sources for mobile drill rigs, and power for natural-gas pipeline pumping stations.

The CJ-805 turbojet will be modified into the Model 240 gas turbine, generating up to 20,000 shaft horsepower within a 290-in., 6500-pound frame. The basic power package uses the CJ805 gas generator with a free turbine and reduction gear and operates on a broad range of fuels. As a trailer-mounted generator power package providing 7500 KVA, it will be powerful enough to light small cities and is compact and light enough to be air-lifted.

. . . and Goes on the Water

The discovery of the principle of supercavitation brought one step closer to reality ocean-going hydrofoil ships. Cavitation is a phenomenon which occurs when vehicles move through water at high speeds. As speed increases, a vapor pocket forms on the leading edges of the propeller and struts, lessening the lifting capacity of the foil.

Studies by the Navy led to development of a new foil which allows for cavitation without sacrificing lift. When applied to a propeller, it increases the speed at which a ship can be efficiently driven.

The supercavitation principle along with the high rpm and high power-to-weight ratio of gas turbine engines have resulted in a breakthrough in hydrofoil boat development. Larger boats of up to 300-passenger capacity are expected to follow in the next decade.

As for the turbine engines powering these ships, the propeller of the helicopter has been reduced in size and water has been substituted for air. The propulsive equipment pushes the ship suspended over the seas by the hydrofoils at speeds of 70 to 90 mph. The primary power source for one ship now under development by Grumman Aircraft Engineering Corporation for the Maritime Administration, weighing 90 tons, will be the G-E Model 240 turbine engine.

Aircraft Nuclear Propulsion

In place of kerosene or gasoline, use a nuclear reactor as a power source and attach it to a turbojet engine and you

have the ultimate in aircraft range potential, the aircraft nuclear powerplant. Such a machine may soon propel an aircraft around the world without refueling. Principal limit to the aircraft's operation will probably be the endurance of its pilots.

A high-performance nuclear turbojet is now being developed by General Electric and will be available for flight testing in the mid-1960's. A major milestone in the Aircraft Nuclear Propulsion program, under contract with the Air Force and the Atomic Energy Commission, was recently accomplished when two modified turbojet engines were run up to normal operating performance on nuclear power alone. "It is no longer a question of can we build a nuclear powered aircraft propulsion system," the manager of the project said, "but when we can place the nuclear direct-air-cycle engine in an aircraft."

Out Into Space

Approximately six years ago, General Electric initiated an extensive company-funded study to explore ways of building extremely large-thrust rocket engines. These investigations, now being supplemented by a study contract awarded by the National Aeronautics and Space Agency, led to the pioneering of a unique engine-design concept called the "plug-nozzle" engine.

This type of engine promises a significantly shorter development cycle at substantial cost savings, as well as weight, performance, and reliability advantages over so-called "conventional designs." The engine can be built from known engineering data, without extensive "cut-and-try" experimental methods *and it can be scaled to any thrust level* with a minimum of development time and expense.

General Electric studies of the "plug nozzle engine" indicate its over-all length would be about half that of designs now in use and under development. Combustion in the plug nozzle engine would take place in a number of small segmented cells banded about the base of a large cone-shaped "plug," rather than in a single large combustion chamber.

In-flight direction control could be achieved by varying combustion in one of these segments, eliminating the need for the usual positioning mechanism required to maneuver conventional engines. Since the engine can be mounted directly to the vehicla frame, further weight and space savings are possible.

Development engineers say that once basic development is completed, the engine can be readily and economically scaled to virtually unlimited, multi-million pound thrust levels.

In the void of space, a few ounces of thrust can control vehicle flight paths. One way to achieve this thrust over long periods of time is electrical propulsion. General Electric and other manufacturers are investigating ion engines which electro-statically accelerate mass, such as cesium ions, to produce thrust.

The foregoing describes briefly a spectrum of propulsion, a group of building blocks of great variety and use. But the strangest device of all is the combination of certain ones into a machine making possible trips to planets such as Mars and Venus and returning. It may sound something like a soup recipe but most assuredly the following is more highly complex.

Take a nuclear powered turbojet, a nuclear powered ramjet, and finally a nuclear rocket — put them all together in a manned missile, and you may one day be making a pass through the atmosphere of Venus with no fears about the return trip.

How might it work? When materials of the direct cycle reactor are developed to enable high-temperature operation and the transfer of heat to either air or hydrogen, the reactor may be employed in these transitional-type flight vehicles. These ships would use nuclear turbojets from ground takeoff to altitudes and flight speeds where the turbojet configurations would undergo gradual transition to ramjet configurations. The ramjet configurations would be used to attain higher altitudes and higher flight speeds and would then undergo further transformation to become a nuclear rocket. This, at the outer fringes of the atmosphere, would accelerate as a reactor-heated, hydrogen-propelled rocket, carrying a heavy cargo of hydrogen into orbit.

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RESEARCH

(Concluded from page 10)

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D. Selection
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- Interviews
- Employment
- Evaluation
- Credentials

G. Rewards
- Salaries
- Incentives
- Security

H. Promotion
- Training
- Education
- Experience
- Responsibility

III. Representative Curricular Components

A. Competences
- Knowledges
- Interests
- Skills
- Attitudes

B. Attitudes
- Work
- Supervision
- Success
- Values

C. Knowledge of Self
- Interests
- Aptitudes
- Abilities
- Potential

D. Occupational Information
- Opportunities
- Qualifications
- Rewards
- Incentives
- Implications

Now that the functions of industrial arts were defined and analyzed, Dr. Olson proceeded to devise a system of *industrial categories representative of the basic American industries*. Each industry was analyzed and the content of these lengthy analyses was considered as representative subject matter for industrial arts. These analyses of industry should serve as an outline for industrial arts subject matter.

Industrial Categories

The industrial categories listed and analyzed as to content were: ceramic industries; chemicals industries; food industries; graphic arts industries; leather industries; metal industries; paper industries; plastics industries; rubber industries; textiles industries; tools and machines industries; power industries; transportation industries, including airway, vehicle, highway, railway, waterway, and conveyor; electronics industries; management; research industries; and services industries.

From these analyses was developed a set of curricular components which were used as the basis for meeting the six functions of industrial arts in all the basic industrial categories. Applications of these curricular components for each of the accepted functions for each of the basic industries was outlined.

As an example following is the application to the power industries.

The Power Industries

Technical Function
- Theory, principles of internal-combustion engine.
- Theory, operation of carburetion systems.
- Theory, principles of electric motors.
- Theories, applications of hydraulics.
- Adjust, tune-up practices.

Consumer Function
- Selections of engines, motors for home, farm, recreation.
- Computation of operating costs.
- Qualities of lubricants, fuels.
- Comparison of features of automobile engines.
- Materials used in engines, motors.

Occupational Function
- Occupation opportunities in power products manufacturing.
- Opportunities in research, engineering.
- Occupations in services, installation, maintenance.
- Nature, extent of training, education, apprenticeship.

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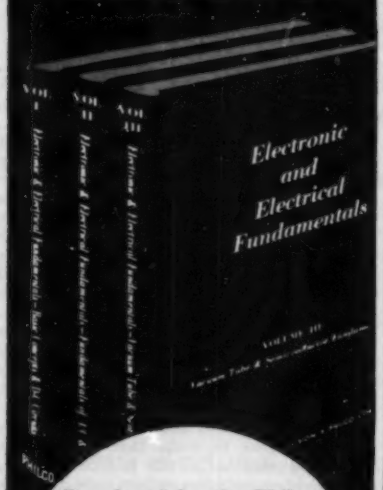

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Here, then, is an example of how technology can be applied in industrial arts. Certainly such a procedure if followed throughout the country, would call for drastic revisions in industrial arts curriculum content as well as the training of teachers and the organizing of industrial arts laboratories. Under such a curriculum, youth would be exposed to the latest of technology. The teacher would have to be a combination craftsman-technician-scientist. Both unit and composite laboratories would be needed.

Program for the "New" I-A

Dr. Olson recommended that to accommodate the "new" industrial arts program in grades seven through twelve, the industrial arts program should be designed to continue through the entire school experience. More specifically, he recommended the following: 7th grade — the laboratory of industries, with major emphasis on the recreation function; 8th — the manufacturing industries; 9th — the construction industries; 10th — electronics; 11th — power and transportation; and 12th — management and services.

The program for each year should be broader than it is deep. Industrial arts, while still centered about manipulation of materials, tools, and machines, should involve much more if it is to reflect the technology. Planning, scheduling, designing, experimenting, and other facets of technology must be used.

In the "new" industrial arts the pupil project occupies fully as significant a position as it has in the past. However, the project must reflect the technology. The project must incorporate elements of the subject matter, such as, industrial materials, processes, products, machines, principles, mechanisms, and other such components. The project should involve design and research. Such a project will frequently involve experiences not familiar to the teacher. The teacher should learn and grow with the class.

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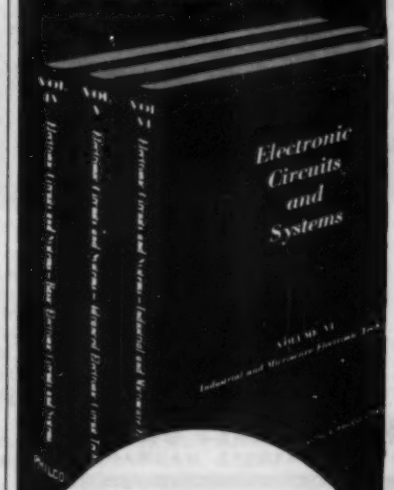

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Elements of Electronics — Second Edition

By Henry V. Hickey and William M. Villines, Jr. Cloth, 549 pp., 6¼ by 9¼ in., illus., $6. McGraw-Hill Book Co., Inc., New York 36, N. Y.

The second edition of this text offers the reader basic training in elementary electronics. Designed to cover enough material to prepare the intermediate-level student to advance into any of the branches of electronic engineering, it is the authors' contention that the thorough comprehension of this book should prepare the student for further study at the second-year college level in electronic engineering. Fifty chapters of approximately equivalent amounts of subject matter enable the student to complete the study in ten weeks by covering one chapter daily.

This book is for anyone who needs a foundation in electronics before progressing to engineering levels; or in industry wherever a basic knowledge of electronics is required to help the user to perfect an understanding of a job; or to supplement knowledge in related fields.

Mechanical Drafting Essentials — Third Edition

By Francis T. McCabe, Charles W. Keith, and Walter E. Farnham. Paper, spiral binding, 263 pp., 8½ by 11 in., illus., $4. Prentice-Hall, Inc., Englewood Cliffs, N. J.

This text and workbook combination presents in logical sequence the alphabet, vocabulary, grammar, idioms, and constructions of the graphic language in such a way as to enable the student to obtain a reading knowledge of this language and to develop the technique of its penmanship in the most direct manner.

The work is covered in seven parts. The primary emphasis is upon reading, interpreting, and sketching for those whose occupations require that they be able to read and interpret drawings or blueprints, and, second, for those who will become draftsmen where the manipulative skill required for their work is more readily acquired after they have had training in reading and interpreting drawings and in sketching. Instrumental drawing is introduced later, after instruction and practice in the fundamental processes.

General Shop Projects

By Manley L. Zanco. Cloth, 109 pp., 5½ by 8¾ in., illus., $3. McKnight & McKnight Publishing Co., Bloomington, Ill.

The purpose of this book is to aid the industrial arts student in the sixth, seventh, eighth, or ninth grades, or anyone interested in constructing useful and attractive projects of metal and wood, to know exactly what to do and when. The book is divided into three sections — projects made of metal, projects made of wood, and projects made of metal and wood. Each section contains fifteen different projects. The first ten projects in each section have a different type of layout than the last five. In the first ten, an industrial arts student — named Johnny Justright — is featured looking at the project he would like to make, and showing also his own ideas on how to make that project in a different method; in the last five projects of each section the author does not suggest other methods, but allows the student to use his own ideas in constructing the project, to suit his own purposes.

Experiments With Materials and Products of Industry

By Arthur W. Earl. Cloth, 351 pp., 6⅛ by 9¼ in., illus., $6. McKnight & McKnight Publishing Co., Bloomington, Ill.

It is the author's hope that this book will help to serve as the foundation upon which the educational values of research and experimentation will develop and grow, and result in the advancement of industrial arts teaching. The material presented in the book helps students learn, through actual experience, the value of experimentation and research to industry, and develops in young people a desire to inquire, search, create, investigate, and explore. The book presents research-type problems which require the students to think through a problem; design and construct a testing device; set up controls and precautions; conduct the experiment or test; and record and analyze results. Working on these problems also encourages library work as the student seeks out background material; contacts with industry through correspondence or visits; and basic points to good writing through letters of inquiry, and the recording of results.

The Story of Chemistry

By George Lockemann. Cloth, 277 pp., 4⅝ by 7⅛ in., $4.75. Philosophical Library, New York, N. Y.

This is a history of chemistry from Antiquity to the present. Extensive knowledge of the subject is not needed to follow the author. The inclusion of the most modern developments is complemented by the new light thrown on early chemistry in Egypt and Greece.

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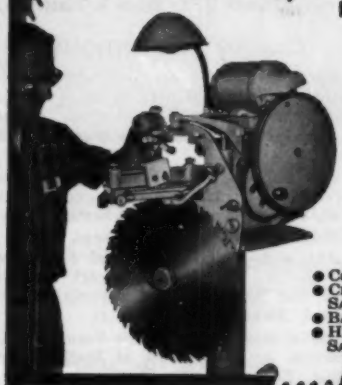

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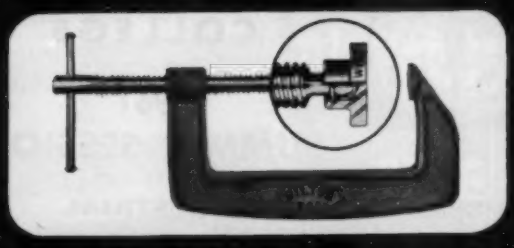

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NEWS

(Concluded from page 6)

conferences, workshops Among the conferences and workshops in industrial education scheduled for this spring and summer:

The Birch Coulee Industrial Arts Club's sixth annual workshop at the North Central School and Experiment Station at Grand Rapids, Minn., August 13–19, on small engines and artcraft metalwork. Contact Floyd Wurscher, Gaylord, Minn.

The 23rd Annual Spring Conference for Industrial Arts May 4 and 5, at the New York State University College of Education at Oswego, on "Industrial Arts in a Changing Culture," featuring Rudolph Bannow, NAM president and Solomon Barkin, director of research for the Textile Workers of America. Contact Paul W. DeVore, conference chairman at Oswego.

The Southern Illinois University at Carbondale, Ill., a series of short courses on such topics as "The Area Technical School of the Future," "Professional Writing for Publication," "Industrial Arts in the 1970's," etc., June 19 through August 11. Contact Marvin Johnson, assistant professor of industrial education at Southern Illinois.

Two workshops for teachers of electricity and electronics at Western Michigan University, Kalamazoo — the first for junior and senior high teachers, July 31 through August 11; the second for technical school teachers on August 14 through 25. Contact School of Applied Arts and Sciences at Western Michigan.

The industrial arts department of Wisconsin State College and Institute of Technology at Platteville is conducting an I-A Teacher Conference and Southern Wisconsin Area Student Craftsman Fair, April 29. Featured speakers include representatives from industry discussing advances in the fields of welding, drafting, and electronics. Contact H. Pederson at Platteville.

COMING CONVENTIONS

Apr. 5–6. New York State Steering Committee for Industrial Arts, at Mark Twain Hotel, Elmira, New York. Secretary, James R. Crawford, Midland Avenue, Central Valley, N. Y.

Apr. 5–7. American Industrial Arts Association, at St. Louis, Mo. Program chairman, Robert Swanson, Stout State College, Menomonie, Wis.

Apr. 6–8. Indiana Industrial Education Association, at Sheraton Hotel, French Lick, Ind. Secretary, A. A. Himelick, High School, Kokomo, Ind.

Apr. 6–8. New York State Vocational & Practical Art Association, at Mark Twain Hotel, Elmira, N. Y. Chairman, William S. Barnes, 223 Newcastle Road, Syracuse 4, N. Y.

Apr. 28–29. Colorado Industrial Arts Association, at Campus of Colorado State College, Greeley, Colo. Secretary, James A. Huth, 2309 Mt. Vernon, Colorado Springs, Colo.

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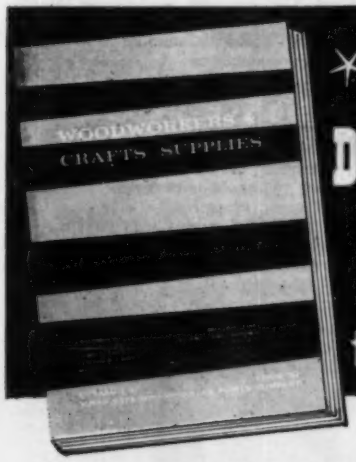

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(For further details encircle index code 0401)

saw-knife From Stanley Tools, division of The Stanley Works, this all-purpose saw-knife (#2299S) holds saw blade or knife blade for use as a keyhole saw or knife in the cutting of wood, metal, and a variety of materials. Contoured 6⅛-in. aluminum handle, die-cast in two sections, has storage area for three razor-sharp knife blades and blade guard. Hole at tip of handle is designed for hanging tool on nail or hook. A cord may be tied to hang hole to keep saw-knife within easy reach. Complete with wood-cutting blade, metal-cutting blade, three knife blades, and blade guard. Further information available.

(For further details encircle index code 0402)

Stanley Saw Knife

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and 14 ft., respectively, although any panel length can be accommodated on either model. Both units are equipped with Black & Decker heavy-duty saws which operate on 115 volts, 25 to 60 cycles, single phase, a.c. or d.c. A 220-volt motor is also available. A switch-lock on the motor permits continuous running for ripping operations. The 2-way Panel Saw is expected to complement the existing DeWalt line of radial-arm woodworking and metal-cutting machines, especially with the accelerated use of panels in component construction techniques. The new unit is adaptable for cutting a wide variety of panel types, including wood, plastic, aluminum, and various composition materials.

(For further details encircle index code 0403)

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(For further details encircle index code 0404)

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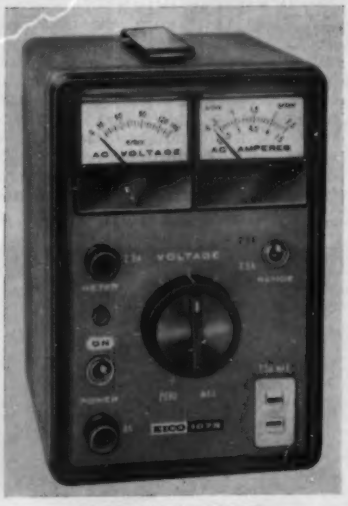
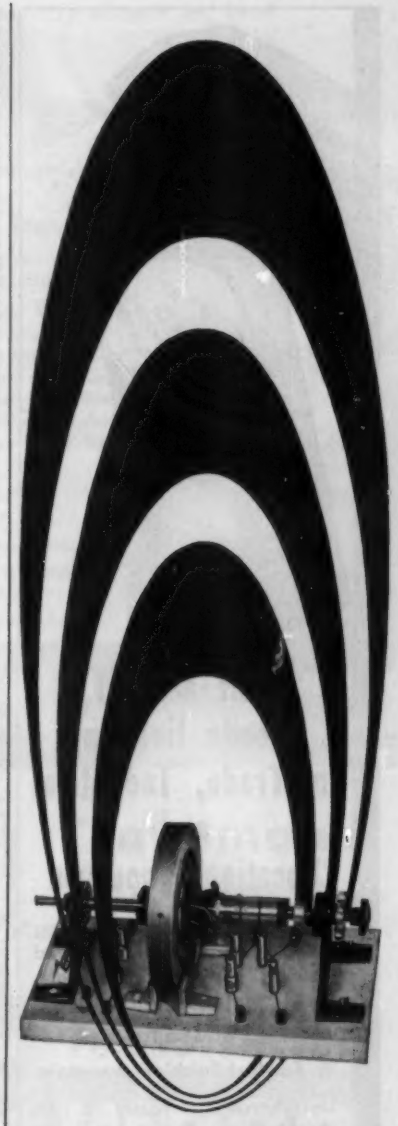
(For further details encircle index code 0405)

bench supply units From Electronic Instrument Company, Inc., two new units, Models 1073 and 1078, variable a.c. bench supplies, useful for production line testing, quality control, and service work. Available in both kit and wired form, the models are identical in every respect save current rating and ammeter range. The current rating of the 1073 is 3 amps and its

(Continued on next page)



EICO Model 1078



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Desmond Bros.
P.O. Box 2216 Torrance, Calif.

SHOP EQUIPMENT NEWS

(Continued from previous page)

ammeter ranges are 0–1 and 0–3 amps; the current rating of the 1078 is 7½ amps and its ammeter ranges are 0–2½ and 0–7½ amps. Both units are capable of delivering 0–140 VAC from a 120 VAC power line. Both feature highly efficient variable auto transformers of toroidal core design and smooth rotary brush-tap controlled by a dial on the front panel. Both have separate output voltmeters and dual-range ammeters on which switching under load from one range to the other is permissible. Please write for further details.

(For further details encircle index code 0406)

gyro-vise From The Columbian Vise & Manufacturing Company, to be used upright in the conventional manner, or laid flat on either side or placed at any angle. The vise operates from a base on which it

Columbian's Gyro-Vise

can be rotated and locked in position. When not in use, it can be removed from the base and stored in a drawer or tool chest. Additional bases may be placed at different locations and vise easily moved from job to job. Known as No. 73½, the Gyro-Vise has a jaw width of 3½ in., jaw depth 2½ in., jaw-gripping area 7⅞ in., maximum jaw opening 5 in., capacity of the removable and replaceable pipe jaws ⅛ to 1½ in. Vises are 8½ in. high and weigh 16½ lb. Gyro-Vises are recommended for every type of light shopwork. Applications include use with drill presses, carpentry, sanding, sawing, tool sharpening, plumbing, and widespread use in home workshops. Ask for descriptive Bulletin L-3990.

(For further details encircle index code 0407)

room-divider furniture From Allied Radio Corporation, the new Knight room-divider stereo system furniture, consisting of supporting poles with predrilled holes, plus divider shelves and matching cabinets. Matching accessory items include a combination cabinet that can be used either for record storage or for accommodating tuner, amplifier, and record changer. A speaker enclosure that will accept any 12-in. speaker and tweeter is also avail-

(Continued on page 64)

Room-Divider Furniture

AMERICAN TECH
Publishers since 1898

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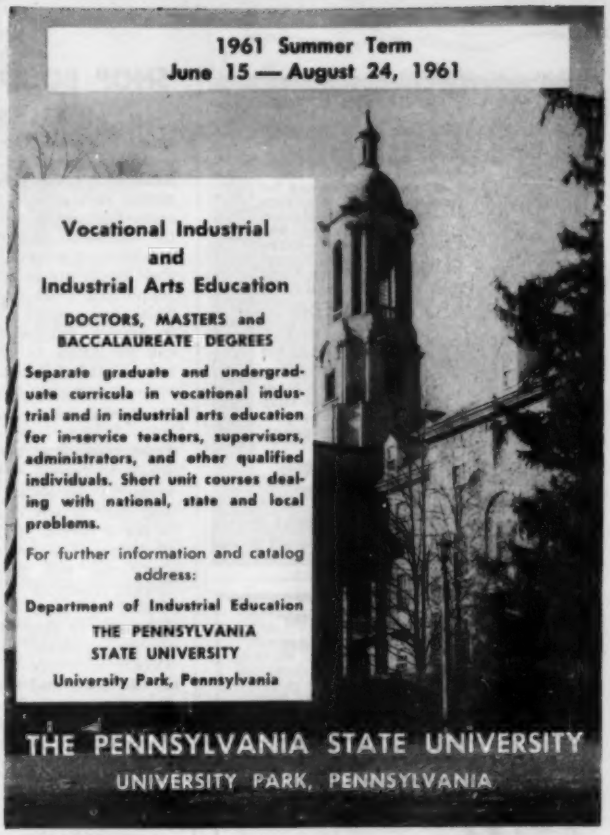
1961 Summer Term
June 15 — August 24, 1961



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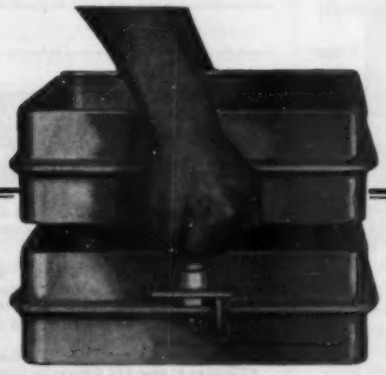

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8501 Stellar Drive, Culver City, Calif.

SHOP EQUIPMENT NEWS

(Continued from page 62)

able. The enclosure features an adapter board for installing an 8-in. speaker instead of a 12-in. speaker. Both the combination cabinet and speaker enclosure are easily fastened to the supporting poles with the hardware supplied. Divider shelves, combination cabinet, speaker enclosure, and shelf backs are in oiled walnut finish. The supporting poles have a rich satin brass finish and are 84¼ in. long, and 1 by 1 in. square. Additional cabinets and shelves can be added to the installation at any time. Detailed information available on the various complete ensembles to be had.

(For further details encircle index code 0408)

free service certificate From The Black & Decker Mfg. Company, for the repair of the electric hammer covered free and clear of any charge for parts or labor — for a period of one year from date of purchase. This offer, made in a service certificate, will accompany all Black & Decker Portable Electric Hammers purchased by users during the period from February 26 through June 30, 1961. Each service certificate will register the Black & Decker Hammer which it covers as well as the name and address of the purchaser. It covers mechanical or electrical failure during normal use and operation. Repairs under the certificate will be made at any of Black & Decker's 50 factory service branches located throughout the United States. Two new-capacity electric hammers are being introduced. The complete line now includes four units with rated star-drill capacities in concrete as follows: ½-in. hammer; 1-in. hammer; 1½-in. hammer; and 2-in. hammer. B & D hammers can be equipped with a wide range of B & D-built accessories for drilling in concrete, masonry, and brick; gouging and shaping timbers; chipping and scaling metal; channeling for pipe and conduit; demolition; and caulking and chiseling.

(For further details encircle index code 0409)

vertical milling machine From U. S. Burke Machine Tool Company, a special vertical milling machine for hydraulic duplicating, which is built from standard U. S. Burke components. Extra rigidity is acquired by raising and lowering the knee to follow the contours of the master rather than actuating the quill. The heavy knee cylinder is mounted in place of a conventional vertical feed screw, and manual vertical knee feed is retained to facilitate setup. Air hydraulic longi-

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(For further details encircle index code 0410)

safety bottle carrier From The General Scientific Equipment Company, this thick-walled polyethylene container, available to replace leather or canvas carriers. Its safety features include a heavy

Safety Bottle Carrier

wire handle sealed in plastisol and secured to integrally molded-on ears. The bottle, held firmly in place with a snap cover, is cushioned from shocks and breakage is prevented, thus eliminating the danger of accidents and injuries. Safe and practical for the handling of chemicals in containers. In requesting complete information ask for Bulletin 49.

(For further details encircle index code 0411)

automatic saw filer From Foley Manufacturing Company, the automatic saw filer which files combination — rip and crosscut — circular saws automatically, will be exhibited, along with the Foley full line of new maintenance machinery in corner booth No. 1036, at the Western Metal Exposition and Congress at the Pan-Pacific

(Continued on next page)

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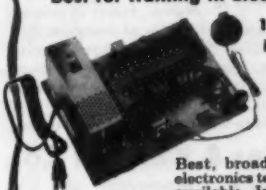

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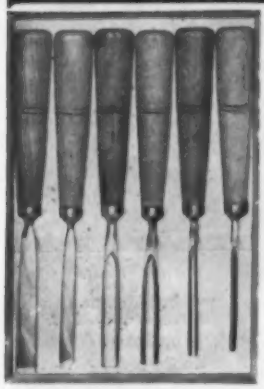

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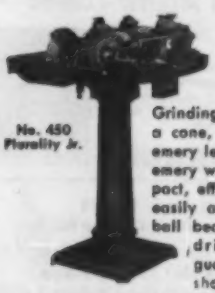

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SHOP EQUIPMENT NEWS

(Concluded from previous page)

Foley Model 200

Auditorium in Los Angeles, on March 20 to 24. Demonstrations to be conducted include taking blank saws, cutting teeth in them, setting the teeth, and sharpening the newly cut and set teeth in the automatic saw filer. These demonstrations may be seen through the year also by visitors to the Foley model shop at 3300 N.E. 5th Street, Minneapolis 18, Minn.

(For further details encircle index code 0412)

safety frames with side shields

From Watchemoket Optical Co., Inc., new safety frames with soft vinyl side shields that fold flat against the frame for convenient storage in pocket or carrying case, then open up for full side shield protection. The side shields conform to facial con-

Safety Frames with Side Shields

tours, the temples telescope in and out and a universal nosebridge assures proper fit and protection for every worker. Protection is afforded against all types of flying particles, dusts, sparks, and harmful light rays. Total weight of new Rapido Fold Flat Model, including glass or plastic lenses, less than two ounces. For complete details and prices write for Bulletin #607.

(For further details encircle index code 0413)

Descriptive . . .

From Challenge Machinery Company, a catalog of composing room equipment items such as quoins, keys, galleys, galley cabinets, and type-high gauges. When asking for this 12-page, two-color, illustrated catalog, refer to publication No. 870.

(For further details encircle index code 0414)

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READER'S SERVICE SECTION

INDEX TO SHOP EQUIPMENT

The index and digest of advertisements below are provided for your convenience in requesting free product information, catalogs and literature offered by the advertisers and the manufacturers listed in Shop Equipment News. To obtain this information or literature, encircle code numbers, sign the card, and mail. Your request will receive prompt attention.

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